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The Outlook

Who Can Tell?

OUR good friend, Mr. John K. Northrop, is to be congratulated not only on the excellence of his aircraft, but on his memory. In a contribution to *Aviation Week* he recalls a series of forecasts by prominent British technicians published in "a British aviation magazine" in 1938, observing that it was almost unanimously believed that large flying boats would be the universal long-range air transport vehicles, that the speed of military aircraft could never exceed 600 m.p.h., and that 200-250 m.p.h. was the all-time economic limit for passenger transports. "The individual," he pursues his ruthless recollections "who seemed to have the best insight into the future on most matters thought it would be at least ten years before pressurized cabin transports would be practical, yet such airplanes were in regular airline service in the United States within two years." Finally, he rubs salt into the wounds with: "Wood was recommended by one designer as the most suitable material for military airplanes; another thought 3,000 h.p. to be the all-time maximum power that could be expected from aeronautical engines . . ."

Certain of the predictions quoted are to be found in *Flight* of April 28th and May 5th, 1938, though diligent examination of those issues fails to bear out the remainder of Mr. Northrop's assertions.

But good friend that he is, we may be sure that Jack Northrop is not setting out to ridicule or humiliate our designers. Far from it. He has nothing more in mind than directing the attention of his readers to the need for caution in taking any such predictions—his own included—too seriously.

The reasons why forecasts by responsible authorities should prove almost humorously fallacious in as short a period as ten years are readily evident if one glances back. Britain's development of the aircraft gas turbine alone occasioned a metamorphosis in design.

While thanking Mr. Northrop for his salutary reminder, we would put a friendly New Year question to him. Did he himself foresee that, parallel with a 500-m.p.h. eight-jet flying wing, his company would now be developing, in answer to public demand, a civil transport machine with three piston engines, a fixed undercarriage, and a cruising speed of 165 m.p.h.?

Nationalized Air Transport

CONSCIOUS objectivity marked the paper read by Mr. J. W. S. Brancker before the Institute of Transport on January 3rd. He did not attempt to say whether or not the nationalization of British air transport is A Good Thing. What he did do was to draw attention to certain features of it which are often blamed for financial and other shortcomings, but which, in his view, would have occurred equally under private enterprise. The presentation was, in fact, one of the fairest we have had, and was shorn completely of any of the irrelevant acrimony which has so often marred discussions of this thorny problem.

Mr. Brancker wasted no time on "might-have-beens"; the nearest he came to that was a very moderate statement that if civil aviation had not initially been inextricably bound up with the idea of war and defence, and if it had been able to show profits immediately it started many years ago, it might have been strong enough to have reached the flourishing state of the Mercantile Marine in the times of Elizabeth, and might then have retained its strategic importance without in any way losing its independence.

Tracing the history of British civil aviation from the days of the four separate companies through their amalgamation into Imperial Airways, and finally the creation of B.O.A.C. from Imperial and British Airways, Mr. Brancker blamed indecision in the immediate post-war years for much that has happened. First we had the

Caretaker Government setting up a Ministry of Civil Aviation, followed by months of deliberations. Then the present Government abandoned the former Government's schemes and, after further delays, established the three nationally owned Corporations. "It would," Mr. Brancker said, "be difficult to over-estimate the remarkably harmful effects of having no definite policy at a time when it was essential for all possible effort to be concentrated on constructive work and not dissipated in discussing what was to be done. In this respect I think that the idea alone of nationalization must be considered to have been harmful, because if private enterprise could have been given the 'all clear' it might have made a very much more rapid start."

It was refreshing to hear Mr. Brancker admit that under nationalization there was a tendency to adopt the Civil Service outlook and to get the organization closer and closer to Civil Service lines, "by no means the right ones for air transport."

Mr. Brancker did not think nationalization had interfered with obtaining the right types of aircraft.

Ordering Direct

AN announcement from Downing Street that in future British Air Corporations will be allowed to negotiate directly with the manufacturers for their new aircraft instead of ordering through the agency of the Ministry of Supply, will be received enthusiastically. This course has for long past been advocated by operators and industry alike, but opposed by the M.o.S. The change should not only effect important economies in time and personnel but also go a long way towards re-establishing close co-operation and goodwill between makers and operators, which alone can ensure the best results. Efficiency has been impaired by the less direct approach and lack of personal contacts attributable to the interposition of a third body.

The old system was criticized by the Courtney Committee investigating the Tudor position; the new procedure follows recommendations from the advisory group set up by Lord Nathan, under the chairmanship of Mr. J. Hanbury-Williams, and including Sir Rowland Smith and Mr. G. Wansbrough, almost exactly a year ago.

Development of new aircraft, wisely, we think, is to remain under the general control of the Ministry of Supply whose research work is largely financed from public funds. At an agreed stage in the development of an aircraft, the Corporations will be able to step in and place a production contract.

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The Palestine Outrage

THREE years ago the United Kingdom was regarded by the rest of the world with respect; its prestige had never stood higher. To-day the Jews in Palestine can shoot down aircraft of the Royal Air Force and our pilots are forbidden to fire back. The recent provocative and impudent act naturally led to strong protests.

The Air Ministry has stated that the R.A.F. aircraft were on reconnaissance above Egyptian territory when they were shot down by Jewish fighters. The Jews claim that some were inside their border. It would not be surprising if some of our pilots, in taking evasive action (how it must have galled them to be limited by official instructions to do this!) had inadvertently crossed the border. The full facts of this incredible incident with all its ramifications are not known as we go to press, but the results are deplorable, and the very presence of our muzzled military aircraft on a tensioned border-line seems highly regrettable.

It has been reported (but not officially confirmed) that the attacking fighters were Messerschmitt Me109s. That may well be the case, for it is known that the Czech national aircraft works at Cakovice, formerly owned by the Avia firm, were building this machine. The top speed is less than 400 m.p.h., and it might have been thought that our Spitfires and Tempests should easily have been able to avoid being shot down, but probably the attack came as a complete surprise and our pilots would obviously be preoccupied with watching the ground during their reconnaissance.

CONSTRICTED PYTHONS: Though the Python-Lancaster, which flew for the first time on January 3rd, will provide valuable experience in the operation of the new power units, a faster machine will be needed for the study of characteristics at high powers and speeds.

Export Trainer

A flight of Prentices destined for the Royal Indian Air Force, on test over Hertfordshire.

Substantial Argentine Order for Prentices : High-Altitude Operation Tests in India

PERHAPS the greatest compliment that any foreign country can pay the British aircraft industry is to equip its Air Force with British aircraft. The individual company which secures an order is especially to be congratulated, and by selling a large number of Prentices and the licence to build more in South America, to the Argentine Government, Percival Aircraft have added appreciably to their prestige and to that of their trainer. Not only the industry but the country at large may well have reason to be grateful for this order, for a large proportion of our meat ration is supplied by Argentina, and many people had begun to wonder what we should eat when all possible nourishment had been extracted from the one-time British-owned Argentine Railways. It seems that the answer will be, for some months—approximately £1,000,000-worth of Prentices.

Three Air Forces will now use Prentices for training. During last year a start was made towards producing fifty for the Royal Indian Air Force by the Hindustan Aircraft Company at their Bangalore factory. In addition to these, several more home-built Prentices to meet immediate requirements have been flown out to Ambala, an air distance of about 6,500 miles. The Bangalore factory has a complete range of jigs and tools installed, and the first five Indian-built Prentices, it is reported, are well on the way to completion.

Argentine interest in the Prentice was first manifest at the beginning of last year when members of a Purchasing Commission visited Luton. Flight trials were later conducted at the Aeronautical Institute at Cordoba, and W/C. A. N. Kingwell, O.B.E., A.F.C., demonstrated the aircraft out there. He is also to test the first Prentice to be handed over at Cordoba. The Aeronautical Institute, which may perhaps be likened to Farnborough in conception, is directed by Brig.-Gen. Don Juan I. San Martin, who also signed the Prentice contract. Commodore Roberto Gibert, Director of the Air Force Military College, and his instructors were among those who flew the first machine to be sent to South America. It may be recalled that a

Argentine Prentices on the Percival production line at Luton airport.

Export Trainer . . . . .

Prentice with Argentine markings was displayed at the S.B.A.C. display and exhibition at Farnborough during September last year.

An agreement has been signed whereby the Argentine Government may also build Prentices. It seems that the present three-figure order will be sufficient to equip the schools as they are constituted at present, but as facilities—in particular, the number of flying instructors—are expanded, Argentine-built Prentices may be produced to meet the new demands.

Countries which purchase Prentices will receive not only a basic trainer of the new conception, but one which is backed by exhaustive testing and experience in service. R.A.F. units which are to be equipped with Prentices all have their aircraft, although some are not yet up to full strength. Included in particular in this statement are such "all-through, all-weather" Training Schools as Cranwell, Feltwell and Little Rissington.

Veteran flying instructor W/C. A. N. Kingwill, O.B.E., A.F.C., who demonstrated the Prentice in the Argentine.

First design to meet an entirely new Service specification, the prototype Prentice basic trainer had something of a stony path to tread, for a large number of instructors were not in favour of its three-seat layout. Moreover, the aircraft itself, with its big and roomy cockpit, deep screen to give the pupil an excellent view, and large-area, slab-like wings to provide the right kind of low-speed characteristics, turned out to be no beauty. Pupils and instructors alike still dream of a trainer having Tiger Moth characteristics with Vampire performance available, but the R.A.F. basic trainer specification, with economy in mind, stipulates an engine no larger than a Gipsy Queen to energize an immensely strong and lavishly equipped three-seater. The essential docility has been achieved, while speed and climb are acceptable for the type of aircraft. It is praise of a positive character, and all the more to its credit, therefore, that the Prentice has increased in popularity as increasing numbers of pilots have flown it and had an opportunity to experience and appreciate its qualities and equipment as it has come into regular service in the Royal Air Force. The two- or three-seat controversy is still not entirely settled, but it is reported that R.A.F. instructors are finding the third seat of more value than some had expected.

The Royal Indian Air Force are at present carrying out flying trials at high altitude with their Mark I Prentices.

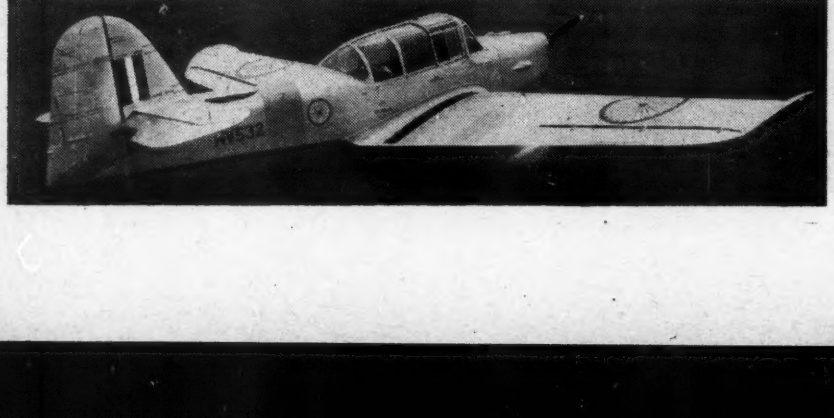
Argentine Purchasing Commission at Luton. (Left to right) Señor Zeoli; Señor Pareta—Aviation Manager of Waldron and Co., Percival Agents in the Argentine; Señor Costa; Señor Cao, and Mr. Ian Brown, Percival Business Manager.

All T.Mk.II Prentices, with 295 h.p. supercharged Gipsy Queen 51 engines to be produced, are for the time being earmarked for the R.A.F. This stipulation may be modified later and availability of the engines will depend on the extent of orders received. It will be remembered that T.Mk.I Prentices for the R.A.F. have Gipsy Queen 32 power units which give 250 h.p. for take-off at sea level. Indian and Argentine T.Mk.Is have 30 Series Queens of the same power, which differ only in details of equipment. All marks have D.H. constant-speed airscrews.

Argentine Equipment

Argentine Prentices will be used to train pilots for what is becoming a very powerful Air Force. Great Britain has already delivered some Lincolns and a few other war-time four-engined Avros, and orders for Gloster Meteors nearly as large numerically as for the Prentices were placed many months ago. In addition to these formidable designs, Argentina has Fiat G. 55 fighters, Sikorsky S. 51 helicopters and Piper L. 4s for reconnaissance and co-op. duties. Trainers in service are Beechcraft A.T. 11 twins, North American Na 16s, and home-built D.L. 22s—another Harvard-like design. Three other important aircraft which may go into service have been designed and built in the Argentine: the radial-engined Calquin, resembling the Mosquito, the Derwent V-powered Pulqui turbojet fighter, and the new Hornet-like A.S.A. Nancu with two Merlins. To these must be added a powerful Transport Division equipped with D.H. Doves, Vickers Vikings, Bristol 170s, Dakotas and Skymasters. The Argentine Naval Air Service which has its own separate training and transport sections, operates a few Catalinas and Walruses.

Prentices continue to come off the production line at Luton to meet both home and overseas orders, and Blackburn General Aircraft are completing their sub-contract order. These basic trainers are still at the beginning of their Service life and developments may be expected.



There is a degree of similarity between the Indian (below) and Argentine markings on these export Prentices.

GROUND CREWS OF THE R.A.F.

An Airman's Views on Sir Philip Joubert's Diagnosis of the Airman's Psychology

By F. A. S. BROWN

THE article "Manning the R.A.F." by Air Chief Marshal Sir Philip Joubert, published in *Flight* of December 9th, was an excellent "appreciation of the situation" from a senior officer's viewpoint.

But, having served in the ranks of the R.A.F. from 1941-1945, first as a flight mechanic and later as a fitter 2a, I should like to add some suggestions based on my own experience and that of others with whom I was acquainted.

In the main, I endorse heartily Sir Philip's diagnosis of the airman's psychology, but I think that possibly he does not know all the facts.

On the paradoxical subject of discipline and happiness, it is a half-truth to say that airmen were happier on the stricter stations. But it is only a half-truth. I have known many airmen (especially those serving with Flying Training Command, where discipline was necessarily strict) who were miserable in the extreme, and who would seek posting elsewhere, volunteering for "conversion courses," and in some cases for overseas service, in an endeavour to escape the atmosphere of repression that existed at many stations.

FOLLOWING publication of the Opinions of an Air Chief Marshal and an Air Commodore on causes of difficulties in the R.A.F., we give here the experience of a ranker who served in the R.A.F. during the war.

His main point is that good tradesmen will never be happy in the Service while they are, as he puts it, "at the mercy of group-five N.C.O.s".

The happiest stations of all were the satellite landing grounds to which airmen from large permanent airfields would be detached. Here the discipline would be effective, though not necessarily slack, and not blatantly apparent; the atmosphere would be cheerful, morale good and all went about their duties with enthusiasm.

Where, as noted by Sir Philip, the men were unhappy due to lax discipline, it was not the lack of discipline, in the sense of rigorous repression and harsh punishment, that they disliked. No human being relishes over-strict control. It was due to the inept administration that so often accompanied slack discipline. Due, in fact, to a by-product of lax discipline.

That brings me to the greatest source of unhappiness in the ranks of the R.A.F. technical tradesmen. It was the excessive authority over tradesmen of all groups given to General Duties (ACH/GD) N.C.O.s.

The G.D. N.C.O.s I heard described soon after my enlistment as "the curse of the R.A.F." Over four years' service has confirmed the truth of this saying. That men of low-grade intelligence or often with complete lack of intellect, should be employed in sanitary squads and similar duties is reasonable, but why should such men be promoted rapidly, to be given charge of discipline and detail administration of a station? Does a mechanized unit of the Brigade of Guards embody senior N.C.O.s of the Pioneer Corps to maintain discipline within its ranks?

Unqualified Administrators

That, in effect, was the practice of the R.A.F. I read recently that the trade of ACH/GD is now extinct, but will the custom continue under the guise of "Orderly"? I know of one G.D. who was, early in the war, L.A.C. in charge of the washing-up party at a training station in England. By 1945 he was Warrant Officer, responsible for discipline, at an Indian airfield, where an L.A.C. M.T. driver, trained at his English station, also served. Needless to say, everyone soon knew of the W.O.'s former dish-washing activities, and naturally, though perhaps unjustly, despised him. He, a tyrant by nature, suffered from an obvious inferiority complex and "took it out" of the technical men, and N.C.O.s too, on every opportunity. Countless instances of such treatment by ACH N.C.O.s can be given by airmen who served in the R.A.F.

At some stations in Britain it was the custom for ground crews to work twelve consecutive days without a break, and then depart on a fortnightly 48-hour leave, half going one week and the other half the next.

Technical N.C.O.s at one airfield where this custom was in force allowed their men to cease work, at their own risk, an hour before passes were issued. The men had thus washed, changed and packed their small kit by 16.30 hours.

The G.D. sergeant responsible for discipline decided to stop this practice but, instead of giving fair warning to the tradesmen N.C.O.s, he walked into the barrack blocks on Friday as the "erks" were changing and placed them under arrest, thus stopping their week-end leave. (One man had arranged to stay with his wife at the seaside.) All were charged and given "jankers." Legally the G.D. sergeant was in the right, but surely he should first have advised those responsible for allowing the men's absence from the hangars to go "unnoticed."

Good tradesmen will never be happy in the R.A.F. while they are at the mercy of group-five N.C.O.s, whatever the designation of the latter.

It is a truism that the R.A.F. is a technical service. A truism so apparent that it blinds many to the fact that even a technical service needs able administration.

"Misemployment"

Due doubtless to shortages of manpower, every available ranker who could be trained for technical employment, particularly in group-one trades, was forced to undergo such training. Many who volunteered for ground service in the R.A.F. had held administrative or responsible clerical positions in Civvy Street and would gladly have continued in such work. Their experience could have been of inestimable value to the R.A.F. Orderly Rooms, Accounts offices, etc. But no! The R.A.F. is a technical service. Therefore, whether it appealed to them or not, they had to undergo training as mechanics. Some certainly became good fitters, but others, especially in the East, found their way into office jobs where they were "misemployed" as clerks but still drew their group-one pay. To be fair to the R.A.F., we must remember that the cost in man-hours of maintaining an aircraft in serviceable condition was increasing before the war of 1939-45, and in fact still is increasing. They naturally decided to acquire as large a technical staff as possible.

Also, the conflict with Japan was unforeseen, and plans were made on the assumption that in the anticipated European war W.A.A.F.s could undertake most administrative tasks. But on many stations overseas, the conditions prohibited the accommodation of W.A.A.F. personnel, and one found group-one tradesmen in the Orderly Room, Accounts section, Equipment stores and Flight offices.

At home this concentration on technical training resulted in detailed administration being left to those with the dullest minds. The "dimwitted G.D. N.C.O. in the

Ground Crews of the R.A.F . . . . .

squadron office" was a by-word of inefficiency, who lost passes and placed men on duty rotas twice ere their mates' names had appeared once.

The granting of administrative commissions was another source of ill feeling amongst intelligent tradesmen. Whenever the chance of applying for an interesting commissioned job appeared in Routine Orders, we found that group-one tradesmen were ineligible. But men of the lower trade groups could become officers and finish the war as Flight Lieutenants, while we of group-one remained L.A.C.s. The theory behind this ruling was sound, up to a point. It was based on the argument that a group-one's technical training was too valuable to waste, and that he must seek a commission, if at all, as an engineer officer. To many this did not appeal, and when it did, educational, age and length of service qualifications were such that most older group-one war servicemen were rendered ineligible. Thus, in spite of executive business experience, most group-one tradesmen were compelled to remain fitters, or to act as ranker clerks to engineer officers, while their friends who joined the Army as infantry privates were frequently obtaining commissions for general duties in that service.

Meanwhile administrative commissions were granted to "erks" from inferior trade groups so that in practice, if not in theory, the primary qualification for an admin. commission in the R.A.F. was the inability to qualify for a group-one trade while serving in the ranks.

I suggest that Secretarial Commissions, as they are now called, should be open to all ranks, regardless of trade group, for the man who can remember the answers well enough to pass a "board" for his group-one "Props" can equally be relied upon to remember all the varied details of administrative work.

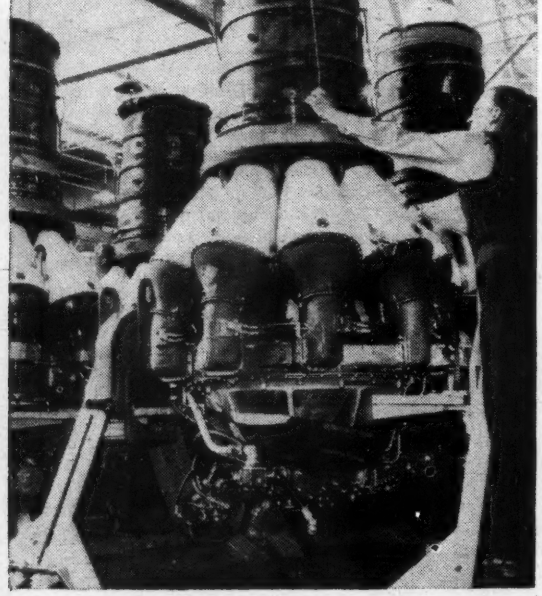
Many of us held the R.A.F. in high regard but think that it would be a happier service if intelligent men and N.C.O.s were posted to the administrative duties so that organization and maintenance should be equally high in standard, while the skilled mechanic should be protected from victimization by lesser men.

The tendency when writing an article of this sort is to look at the question from the point of view of the Service man rather than from that of the Service. Yet it is essential for the efficiency of the latter that its organization conduces to the mental comfort of the former.

. . . By Any Other Name

Pratt and Whitney JT-6B Turbo-Wasp (Nene) Type Tested

IT was gratifying to discover on reading a recent publicity hand-out received from America that it referred to none other than the highly respectable and respected Rolls-Royce Nene turbojet. Since the announcement several months ago of the signing of an agreement for the Pratt and Whitney Aircraft Division of the United Aircraft Corporation to build Rolls-Royce Nenes, the American company has moved with characteristic rapidity and the resulting Turbo-Wasp JT-6B (Navy J-42-P4) has successfully passed its 150-hour military qualifying test with a static thrust rating of 5,000 lb. This is the highest rating so far announced for any American-built gas turbine.



American-built Nenes known as Pratt and Whitney Turbo-Wasp JT-6Bs.

Grumman F9F-2 Panther carrier-based fighters will be the first recipients of production Turbo-Wasps. Several hundred have been ordered by the U.S. Navy.

Of a number of modifications made to "Americanize" the Nene II, the most apparent are those concerned with accessories, their mounting and their drives. In addition, there have been some important changes in structural materials, magnesium being used in place of heavier aluminium alloys for some components. This is in line with British developments of the moment. The Turbo-Wasp has also to be capable of running on aviation petrol as well as kerosene. The diameter has remained the same at 49.5 in, but the length of 98.3 in mentioned shows an increase of 1.5 in.

American production methods are in the main extremely advanced and efficient. In the case of the Turbo-Wasp, new techniques are being applied and some 7,600 different tools are required. This knowledge may bring some comfort to those who are worried about the possible result of selling to Russia between two and three dozen Nenes. Extensive plant area has now been prepared and equipped by Pratt and Whitney for Turbo-Wasp production. Rather more than half the engine components are being manufactured by the company, while some 400 semi-finished or finished parts will be bought outside.

BOOK REVIEW

Man Takes Wings. Published for the Air Ministry by His Majesty's Stationery Office. Price 1s.

THOSE who have seen the R.A.F.'s Mobile Exhibitions will be familiar with the title of this little booklet, which is intended to awaken interest in aviation by spotlighting notable events and developments in the long story embraced by the title, and to increase recruiting returns for the Air Force—Regular and Reserve—by turning interest into action. It is not suggested, however, that *Man Takes Wings* is a recruiting pamphlet—modes of entry into the Service are merely presented in a discreet table, free from fulsome publicity, at the conclusion of the booklet.

The account of flying machines and flying men, past and present, is given by Mr. Gibbs-Smith, whose wartime books on aircraft recognition were exceptionally successful in introducing a sticky subject to the many greatly needed but novice "spotters." In his treatment of this broader and more engrossing subject he shows an equal proficiency, and crams into less than 50 pages much information of birds and balloons, pilots, prophets and pioneers, aircraft in peace and war, and general explanations of flight and propulsion. Also included are suitable illustrations, lists of events in date order, publications, and an aeronautical glossary.

The Modern Autopilot

A Dissertation on the Fundamentals of Modern Automatic Pilot Design

IN the paper under the above title which Mr. Meredith, B.A., F.R.Ae.S., is reading before the Royal Aeronautical Society this evening, the opening and closing paragraphs are respectively entitled Retrospect and Prospect, and in the former the author discloses that shortly after production at the Royal Aircraft Establishment of the world's first pilotless aircraft in 1925, this country was also the first to produce a flying bomb. Given the code name "Larynx" (referring to long-range gun and identified with a Lynx engine), this device was designed to carry a 250-lb bomb at a speed of 200 m.p.h. up to a range of 200 miles.

The Larynx controls were almost identical with those used some 15 years later in the German V-1. It was appreciated at the time that the practicability of such a weapon was dependent upon the development of a cheap engine designed as an expendable store. It was also realized that London was the ideal target for such a weapon and that, as we as a nation were unlikely to be directing an attack against a target of suitable size at suitable range, it was more important to guard the secrecy of the project than to press the development of a suitable engine. The experience from the recent war in which Germany developed these weapons a few years too late to be decisive, vindicates the wisdom of the answer made by the Air Staff to the very nice question posed by this invention.

The general requirements of a successful autopilot to-day are given as (i) capability of rapid, correctly co-ordinated manœuvre; (ii) ability to maintain a compass course indefinitely; (iii) capability of being coupled to radio devices to seek and follow a radio "track" and to follow a glide-path beam for blind approach; (iv) simple and foolproof operation; (v) safety in the event of any foreseeable failure; (vi) freedom from frequent maintenance attention; (vii) capability of rapid replacement by units to avoid dislocation of schedules in the event of failure.

In addition, Mr. Meredith states that in the near future, the autopilot must also be capable of controlling aircraft for short periods, of the order of one second, with little or no inherent damping and with unforeseeable lags in the transmission system, including power-operated controls.

After reviewing the development of the hysteresis servo motor, an achievement made in the face of established authoritative theories as to the impracticability of such work, the lecturer devotes some attention to the amplifier and gives it as his opinion that the magnetic amplifier will, before long, be developed to the stage when it can be employed as the sole amplifying means in such equipment as autopilots. So far, however, it does not provide quite the flexibility of a valve amplifier. In the Smith Electric Pilot (S.E.P.1) of which the author was the designer, valves are employed for signal amplification, and a magnetic amplifier for the power stage to drive the servo motors, thus permitting all valves to be conservatively rated in the interests of reliability. Nevertheless, the valves have proved to be the least reliable element in the whole system.

British Laxity

Mr. Meredith then makes the serious comment: "It is unfortunate that our manufacturers of valves cannot see their way to producing special valves for electronic equipment, requiring a high order of reliability. There is a large field in industry for electronic control if the required standard of reliability could be guaranteed. The American valve manufacturers have seen this and are producing special valves for the purpose. Unless something is done about it, either the job will be done without valves or the art of electronic control will be in danger of becoming an American monopoly."

Under the head of Safety Requirements, the paper states the general agreement that the most important requirement of an automatic pilot to-day is assurance that it will not endanger the structure of the aircraft by dangerous control movements. The possibility of dangerous control movements must be considered under two separate headings (a) false control movements resulting from malfunctioning, and (b) dangerous movements resulting during correct functioning from disturbances forced on the aircraft by rough air or manœuvre.

Various suggestions have been made for auxiliary safety devices to deal with both contingencies, but the author concludes that only strain-gauges carefully placed on the aircraft structural members expected to initiate failure can really provide a solution on these lines.

All aircraft must be designed with reasonable factors for handling by the human pilot in gusty weather. An autopilot can control with smaller movements than the human pilot. Moreover, considering the load on the tail structure, for example, due to gusts acting on the tail surfaces, it is evident that, in this case, rapid correcting control movements reduce the structure loads. Aileron loads are potentially dangerous because of the rapid rolling accelerations which can arise in gusts, and because the aileron may fail independently of the main wing structure. This last also illustrates the inadequacy of accelerometer safeguards, since the rolling acceleration may well be zero, or even in the opposite direction to that caused by the dangerous aileron loads.

However difficult the situation may be in relation to legitimate autopilot-induced loads, it is manifestly desirable to limit, as far as possible, the risk of dangerous loads induced by malfunctioning of the autopilot. This means more than the aim of making the system as reliable as possible: it means ensuring that no foreseeable failure will lead to dangerous control movements. The A.R.B. have recognized the possibility of meeting this condition and have made it obligatory in future autopilots.

These considerations were mainly responsible for the Smith company selecting the rate/rate system whereby servo speeds are related to rates of deviation, instead of control movements being related to deviations.

Stability and Lag

After stating the essential differences between rate and displacement type gyroscopes, and appraising the fundamentals of rate/rate control, the paper goes on to survey stability and the effects of lag, and states that, as aircraft increase in size and speed, it is becoming increasingly difficult, for several reasons, to control them. In the first place, inherent damping is being steadily reduced, especially in yaw. To make matters worse, we are now faced with the problem of indirect operation of the rudder with the certainty that this will introduce appreciable phase lag in the positioning of the rudder. As a practical rule, inertial lag may be neglected if the natural frequency of the mass concerned is not less than five times the demand frequency. The subsidence time of the yawing moment response of a Flettner rudder to a step function input is easily calculated if the hinge moments due to rudder angle and rudder rate are known, but the effective lag is somewhat increased by the initial negative response.

The conventional spring-tab control clearly contains this lag, and it should be noted that the friction of the rudder hinge enhances the rudder movement damping as the amplitude is reduced, so that it is difficult to avoid sufficient lag to destroy all damping of the aircraft motion at some small amplitude. Here, the "set-up" spring tab appears to possess an important advantage over a simple Flettner control, since, for a small amplitude at which hunting might be expected, the tab may be made inoperative.

Power-operated controls require close scrutiny in this respect. Non-linear lags such as the effect of friction are particularly objectionable because they are so unpredictable. The typical characteristics of hydraulic valve mechanisms can easily lead to trouble, since there may well be a "dead spot" before the movement of the valve reverses the movement of the motor. When the amplitude of an oscillation decays till it approaches the magnitude of the "dead spot," the phase of the motor response will lag by approximately 90 degrees. This effect is reduced by valve leakage at dead centre. By judicious design, sufficient motor speed for the small amplitude considered may be obtained by the unbalanced leakage while the valve is still working in the "dead spot."

In view of the potential difficulties arising not only in the case of automatic control but also in that of manual control, it is clear that no power-operated control should be accepted for flight test without a preliminary survey of its transmission characteristics over the range of frequencies and amplitudes with which we are concerned. This transmission characteristic is defined by what is known as the "transfer function" for a simple harmonic motion demand.

Mr. Meredith then examines stability and lag in mathe-

The Modern Autopilot . . . . .

matical terms and concludes with the demonstration that the transfer function of the aircraft has a phase lag of 90 deg at resonance, so that below this frequency the phase lags in the autopilot and the rest of the system may safely be allowed to approach 90 deg. As a result of tests made with phase-advancing network, Smiths have decided to incorporate it as standard in both the rudder and elevator channels of the new S.E.P.1C. The lecturer further suggests that every effort should be made to eliminate the "threshold" lags and to keep the main lags down to a standard which he would like to see set at 0.025 of the highest resonance frequency of the aircraft.

On the subject of radio guidance, Mr. Meredith observes that his company have been simulating the problem of closing and holding a beam in the laboratory, and have found conclusive evidence for the need of making the whole process automatic. It is difficult enough to hold the beam with sufficient precision, but the problem of closing in a reasonably short time using the information provided by compass and beam indicator is far too difficult to impose on the pilot in the trying circumstances of a blind approach. Mr. Meredith observes that it is really illuminating to attempt to execute the manœuvre using the pilot's controller of the autopilot and then, when feeling frustrated, to switch in the autopilot radio switch and see one's mistakes being immediately corrected and the beam signals subsiding cleanly to zero. The lecturer concludes with the expression of a purely personal opinion: that perfectly safe blind approaches will, before long, be a matter of simple routine, using ILS in conjunction with the autopilot, simultaneously with a GCA system supplying a running commentary to give extra confidence to the pilot, and to provide a standby in case anything should go wrong with the necessarily complex sequence involved in the auto-approach system.

AIR LEAGUE BALL

UNDER the patronage of H.R.H. Princess Elizabeth, the Air League of the British Empire and the Guild of Air Pilots and Air Navigators are jointly holding a ball at the Savoy Hotel on Friday, February 11th. The proceeds will be shared between the Guild's Benevolent Fund and the Air League's flying scholarships fund which provides scholarships for young people in general, under schemes organized by the Air League branches, and also for A.T.C. Cadets who have obtained proficiency certificates. The estimated cost for the A.T.C. scheme for 1949 is £12,000 and it is hoped to provide 100 scholarships up to private pilot's licence standard for senior cadets in 1949. The Air League's plan for branch scholarships is to double whatever funds a branch may raise for flying scholarships, up to a limit of £100. The objects of these scholarships are to stimulate recruiting for the A.T.C. and also to increase interest in private flying, and in the latter case they are likely to be of some assistance to the flying clubs. Tickets for the ball which can be obtained from the Guild of Air Pilots or from the Air League, at Londonderry House, 19, Park Lane, are priced at three guineas single and five guineas double; these prices include supper. The ball commences at 8 p.m. and continues until 2 a.m.

CABLING GOOD NEWS

IN addition to the standard range of aircraft cables which British Insulated Callender's Cables, Ltd., have produced for many years, a new range, given the brand prefix "Pren," has recently been introduced.

During the war, the rapid increase in the physical size of aircraft and the increase in the number of services, brought forth an urgent demand for a decrease in the weight of cables installed. Up to that time the orthodox cables conformed to a common pattern, comprising a copper conductor shrouded with a rubber insulation sheath which was in turn bound with oil-resisting tape and cotton braid and finished with a final coating of cellulose lacquer. This form of cable, although perfectly efficient and suited to its purpose, was both heavy and non-flameproof.

Research showed that, by using a polychloroprene sheath over a braiding of woven glass-fibre surrounding the conductor, the insulation characteristics remained unimpaired, whilst additional advantages were accrued in effecting relative flame-proofing, inertia to petrols, oils and hydraulic fluids, etc. (which attack natural rubber) and considerable saving in weight. This latter quality is due not only to the reduction in insulation bulk but also to the fact that, as polychloroprene has a higher temperature resistance than rubber, it allows the conduction core to be proportionately smaller for a given current flow, since temperature is a function of the square of the flow for a constant resistance. Thus, for a given duty, not only are the Pren-type cables smaller and lighter in bulk of insulation but also in core size.

By virtue of the outstanding resistance to burning, it has been possible to specify tests for Pren cables of an order of severity which is new to the aircraft field of application. Test samples of cable, after soaking in hot lubricating oil, are exposed for 15 seconds to the hottest part of a Bunsen burner flame: the cable does not support combustion, and burning or charring is confined to a length not exceeding 6in. Further samples, without immersion in oil, are subjected to electrical break-down tests after similar exposure to flame until the insulation and covering are incinerated. One minute after removal of the flame, the instantaneous break-down voltage between conductors is greater than 500 v (RMS) 50 c/s.

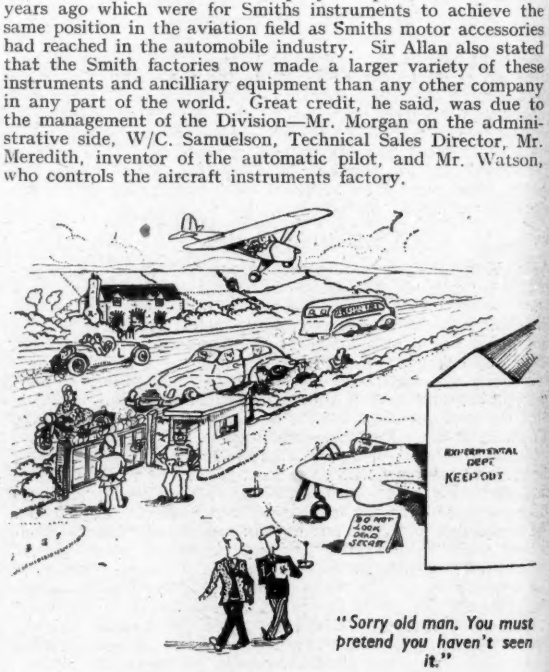
Pren cables are made in a series of unicell (i.e., a single core element) and multicell versions; the latter are individual unicell cables bound together with a glass-braid sheath and lacquered with a polyvinylchloride final coating. Alternatively, multicell cables are available, in 6-amp size, in a polychloroprene outer sheath instead of the glass-braid, in order to afford greater physical flexibility. There are also versions with an outer metal-braid sheath over the glass-braid to afford earth screening characteristics.

These new cables are the only types of general-purpose aircraft cables which are designed for compliance with the officially specified requirements of 208 v between phases, equivalent to 120 v to earth at 400 c/s A.C. They will, of course, cater more than fully for the hitherto orthodox standard 24 v A.C. system.

SUCCESS OF SMITHS AIRCRAFT INSTRUMENTS

SIR ALLAN GORDON-SMITH, K.B.E., D.L., Chairman of S. Smith and Sons (England), Limited, presided at the annual general meeting of the company which was held on December 31st. Reporting a successful year, Sir Allan said that Smiths instruments were being fitted to practically all civil aircraft manufactured in this country. The Smiths automatic pilot was now in production and considerable orders for the Government and for the British aircraft industry were in hand. Reference was also made to this division's entry into the field of aircraft equipment for foreign constructors who are being supplied with instruments and equipment in increasing numbers.

Speaking of the progress achieved by the aircraft instrument division during the past few years, Sir Allan declared that this had fulfilled the company's expectations of a few years ago which were for Smiths instruments to achieve the same position in the aviation field as Smiths motor accessories had reached in the automobile industry. Sir Allan also stated that the Smith factories now made a larger variety of these instruments and ancilliary equipment than any other company in any part of the world. Great credit, he said, was due to the management of the Division—Mr. Morgan on the administrative side, W/C. Samuelson, Technical Sales Director, Mr. Meredith, inventor of the automatic pilot, and Mr. Watson, who controls the aircraft instruments factory.



"Sorry old man. You must pretend you haven't seen it."

HERE AND THERE

VISITOR AT BRISTOLS: Mr. Geoffrey de Freitas, Parliamentary Under Secretary of State for Air, went to Filton on January 5th and flew in the Bristol Type 171 helicopter. He is here seen in conversation with the test pilot, Eric Swiss. Also in the group are (left) Mr. C. F. Uwins, Managing Director, Aircraft Division; and (backs to camera) W/C. A. V. R. Johnson and Mr. A. J. Pegg, B.A.C. Chief Test Pilot.

Lindberg in Germany

COLONEL LINDBERG made a secret visit to the Berlin air lift airfield at Frankfurt on January 4th. He is understood to be on an "unscheduled tour" of U.S.A.F. European bases and went to Germany as a special technical adviser to the U.S.A.F. Chief of Staff, Gen. Vandenbergh, to observe operational procedure and recommend improvements.

Going Up!

PILOTED by Capt. Charles E. Yeager at the U.S.A.F. Base at Muroc, California, on January 3rd, the experimental supersonic Bell X-1 took off under its own power for the first time. The U.S.A.F. reports that this aircraft reached an altitude of 23,000 feet in one minute 40 seconds, a rate of climb more than 13,000 ft per minute, which exceeds all previous records. The Bell X-1 is powered solely by a battery of four liquid fuel rocket motors. The total static thrust of these rockets is some 6,000 lb and the fuels are alcohol and liquid oxygen.

Slick Work

WITHIN 55 minutes of receiving an urgent call from B.E.A.'s charter section on the Berlin airlift to fly spares to a Lancastrian tanker grounded at Wunsdorf, Kearsley Airways had a Dakota airborne from Stanstead. During the 55 minutes arrangements were made with the Control Commission to waive the necessity for military permits for the crew of the Dakota since theirs had expired when Dakotas were withdrawn from the airlift a few weeks ago. After landing at Bovingdon to pick up papers and passports (normally kept at Kearsley's London office) which were rushed there by road, the Dakota flew on to Tarrant Rushton to load up the Flight Refuelling Lancastrian spares. These consisted of a Merlin engine, fins, rudders and elevators. Altogether a highly creditable effort demonstrating how formalities can be cut short when all parties co-operate with enthusiasm.

R.Ae.S. Reading Branch Revival

ON January 26th the Reading and District Branch of the Royal Aeronautical Society are to hold a special meeting at which it is hoped to obtain sufficient support to recommence the activities of the Branch which has been inactive since the liquidation of Miles Aircraft. The meeting is to take place in No. 1 lecture room of the flying school at Woodley Airfield, at 6.15 p.m.

"NOW, IN THE NENE . . ." "Wimpey" Wade, Hawker test pilot, now engaged in development flying on the Nene-powered Hawker P. 1040 and N. 7/46, and soon to test the P. 1052 (likewise with Nene), discusses an elderly Whittle W. 2/700 turbojet at the Schoolboys' Own Exhibition in the New Horticultural Hall, Westminster. Doubtless he drew on the knowledge he acquired during war-time service at the Air Fighting Development Unit of the somewhat later Welland.

New H.P. Test Pilot

F/L. D. J. BROOMFIELD, D.F.M., has been appointed test pilot for Handley Page, Ltd. Early in the war F/L. Broomfield flew Hampdens with Bomber Command, Number 49 Squadron, and from 1943 onwards was engaged on experimental work. Before leaving the R.A.F. in October, 1948, he was testing heavy aircraft at the A. and A.E.E., Boscombe Down, having graduated from the Empire Test Pilots' School. While on loan to Handley Page's last year F/L. Broomfield flew as second pilot of the Hastings on its tour of Australia and New Zealand.

Aero Club Film Show

THE next coloured film show to be given for Members and Associate Members of the Royal Aero Club at Londonderry House is to be held on January 18th at 6.15 p.m. The two films to be shown are "B.O.A.C. Short Solent Flying Boat to Johannesburg," and "With the R.A.A.F. in the Balik Papan Campaign, Dutch Borneo, July, 1945." The first records the inaugural flight of the Short Solent flying boat *Southampton* to Johannesburg in May 1948 gives an impression in natural colour of the tourist route to South Africa. The other film was taken largely from a Liberator on D-Day in the last of the three campaigns in Dutch and British Borneo and shows the use of air power, bombing attacks, and how the taking of an air strip became the principal objective. Mr. William Courtenay will give an eyewitness commentary.

R.Ae.S. Lecture

THIS evening, January 13th, at 6 p.m., Mr. F. W. Meredith, B.A., F.R.Ae.S., is to give a lecture before the Royal Aeronautical Society at the Insti-

HERE AND THERE

tution of Civil Engineers, Great George Street, Westminster. Mr. Meredith will speak on "The Auto Pilot"; light refreshments are being served at 5.30 p.m.

The Society reminds candidates for the Associate Fellowship Examination that a new syllabus came into force on January 1st, 1949, but that papers will continue to be set in the old syllabus up to and including December next. Entry forms for the May, 1949, Examination under the old syllabus must be in the hands of the Society by February 28th. Candidates wishing to take Part I of the new syllabus have until January 31st to send in their entry forms for the May, 1949, examination.

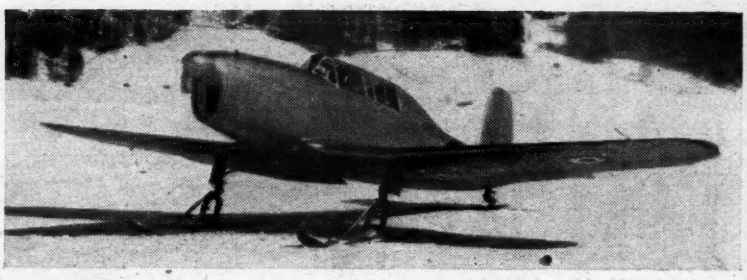
Russian Pilot Remembered

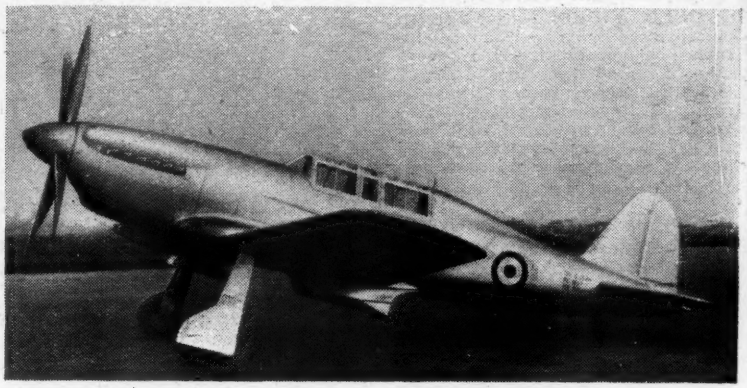
LECTURES and meetings were held recently in Russia, where an exhibition was opened to commemorate the death, ten years ago, of Valeri Chkalov, one of Russia's leading pilots. In 1936 Chkalov made a record flight from Moscow to North America via the North Pole (a distance of 7,145 miles) of which route he was one of the pioneers. He was in the air for 63½ hours. In more recent years Chkalov was responsible for the idea of bringing down hostile aircraft, when all other methods had failed, by means of ramming them with the airscrew of the defending machine. This idea was widely practised against the Germans.

Bader's Inspection Tour

FOR the purpose of inspecting establishments of the Shell Petroleum Co., Ltd., on the route to the Netherlands East Indies, G/C. D. R. S. Bader, D.S.O., D.F.C., the well-known wartime pilot, recently completed a 20,000 mile round trip in a Proctor V; he also inspected the fleet of aircraft maintained by Shell for communications purposes. The outward journey was made by G/C. and Mrs. Bader in the Proctor as far as Singapore; from there they flew in Shell-owned Catalina and Grumman aircraft and returned to London in the Proctor, a standard aircraft fitted with long range tanks and radio. Since it was purchased by Shell in 1947 this aircraft has flown a total of 670 hours on similar inspection tours

PETROL PATROL: G/C. D. R. S. Bader, D.S.O., D.F.C., and the Proctor V owned by the Shell Petroleum Co. in which he made the tour of inspection referred to on this page. In 152 flying hours G/C. Bader covered 20,000 miles.





WITH GIPSY AND MERLIN: The Fiat G. 46-2 trainer, seen above on skis, is fitted with a de Havilland Gipsy Queen 30. Some 70 are to be delivered to the Argentine. A much more powerful machine, along generally similar lines, is the G. 59B-M advanced trainer, with Rolls-Royce Merlin 24-2 engine.

News in Brief

ACCORDING to a recent Russian claim a model seaplane built by a 15-year-old Russian school boy has broken an international endurance record by remaining in the air for 30 minutes 15 seconds.

* * *

Sir Ben Lockspeiser, chief scientist of the Ministry of Supply, on January 5th visited the Schoolboys' Exhibition at the New Horticultural Hall, Westminster; he spent some time explaining a sectioned jet engine to youthful onlookers.

* * *

An agreement has been reached between E. K. Cole, Ltd., and the National Radio and Engineering Co., Ltd., of Bombay, an affiliated company of the Tata organization, for the establishment and development of radio manufacture and distribution in India; this embraces radio receivers, components and electronic devices generally.

* * *

The Waste Paper Recovery Association announces that improved paper salvage during the last year has been largely responsible for larger newspapers now being published. The Association estimates that the larger newspapers will need an additional 1,500 tons of news print a week and stresses the need for continued salvage efforts.

* * *

Sir Roy Fedden has been appointed to the Board of Leyland Motors as director of research and development. Sir Roy is to take charge of a new establishment dealing with long-term policy and plans.

* * *

In a speech welcoming guests to a party held to celebrate the completion of a new hangar at Bromma Airport, Stockholm, Capt. Carl Florman, who has been president of A.B.A., Swedish partner in S.A.S., since its formation, announced that he would retire this year when A.B.A. celebrates its 25th anniversary.

* * *

The Royal Scottish Museum has received as a gift from the Bristol Aeroplane Co. a sectioned and working Hercules 100 aero engine. Skilfully sectioned to show the working of the internal mechanism and fitted with coloured electrical lights showing the sequence of power strokes, this exhibit has been placed in the Hall of Power.

* * *

Recent figures published on January 4th show that 26 per cent of the total air lift supplies flown into Berlin since the operation began last June have been carried by British aircraft compared with 74 per cent carried by American aircraft. The weight of German industrial products lifted out of Berlin into the German western zones since last June totalled 8,167 tons.

CIVIL AVIATION NEWS

Charter Company's Flying Boat Plans : Export and Import Figures : American Review

CLOUD TOP : A photographic impression of the first prototype Brabazon in flight. Subsequent models will be equipped with multiple-wheel bogey - type undercarriages. Mr. A. J. Pegg is shortly going to the U.S.A. to gain experience in flying heavy aircraft.

AMBASSADOR PAYLOAD

WEIGHT and performance figures of the Ambassador have been modified as a result of the development of slotted flaps, and the effects of increased seating capacity in the B.E.A. 47-49-seater version. Split flaps were replaced by slotted flaps to shorten the take-off runway lengths needed to comply with future I.C.A.O. requirements and at the Ambassador's designed maximum all-up weight the take-off distance has been reduced from 1,700 yd to 1,480 yd, while a high payload can still be carried from a runway of 1,300 yd. The flaps will be of the single-slotted type with an 8 per cent chordal movement during extension. The maximum payload is now 11,645 lb and has followed the examination of the latest accommodation arrangements and consequent reconsideration of reserve fuselage strength.

The power plants are Bristol Centaurus 661 with a dry take-off power of 2,700 b.h.p. which can be maintained up to 5,500ft, the full throttle height of the engine. These power plants are designed for a maximum rating of 3,000 b h.p., which Bristols expect to reach with production units as soon as operating experience has been gained at the initially de-rated figure.

CORPORATION'S APPOINTMENTS

WITH the approval of the Minister of Civil Aviation, the Board of British South American Airways have combined the functions of the Chief Executive with those of the Chairman of the Corporation. This decision was reached in considering the appointment of a successor to the late Chief Executive A. Cdre. H. G. Brackley. The Chairman, Mr. J. W. Booth, has been appointed Managing Director and Mr. B. G. Porter has taken over duties additional to those for which he has hitherto been responsible as Administrative Manager. Captain A. Gordon Store who has been Operations Manager of the Corporation has taken over additional technical duties. Each of these appointments carry the designation of General Manager and took effect on January 1st.

FLYING-BOAT CRUISES

AQUILA Airways of London and Southampton have purchased twelve of the B.O.A.C. Hythe flying-boat fleet. Three of these aircraft were delivered last year and flew on the Berlin air-lift between Hamburg and Havel Lake, Berlin, until ice stopped operations in December. Aquila Airways have so far taken delivery of five and expect the remainder at monthly intervals as they come off the B.O.A.C. route to Australia on which they are being replaced by Constellations. The company intend to convert two to 34-seaters for cruising next summer in the Mediterranean area and possibly to Madeira, Norway and South Africa. Arrangements for cruises will be in the hands of travel agents but will work out at approximately £10 a day per passenger including accommodation in the best hotels for several days at ports of call. Flying distance will vary between 600 and 1,500 miles between stops. Two other aircraft will be converted to multi-seaters carrying 50-60 passengers in third class comfort for purposes of immigration. Two others will be allocated for carrying freight for which purpose the normal bomb-doors on either side of the fuselage will be moved aft to give easy access to the spacious fuselage. One will be modified with a door large enough to take complete aircraft power plants. The remaining six Hythes will remain unmodified until the market can be assessed.

B.S.A.A. CRASH

YORK G-AHEX "Star Venture" crashed about two miles from Caravellas, 400 miles north of Rio de Janeiro, on January 5th whilst flying from Natal to Rio de Janeiro. The aircraft had left London on a normal B.S.A.A. service at 10.31 on Monday, January 3rd, with five passengers. At Lisbon three more passengers embarked and at Natal a Brazilian route inspector joined the aircraft, making the passengers total nine. It is customary for Brazil to request that an inspector should fly on occasional services to ensure that flight regulations are adhered to. This inspector, a Spanish woman and an Indian were all killed in the crash, two passengers and the captain, A. C. Graham, were slightly injured, but the remainder were unhurt. The aircraft had left Natal at 0300 G.M.T. on January 5th and it is not known whether the captain was attempting to land at the diversion airfield at Caravellas. At the time of going to press no further details were available.

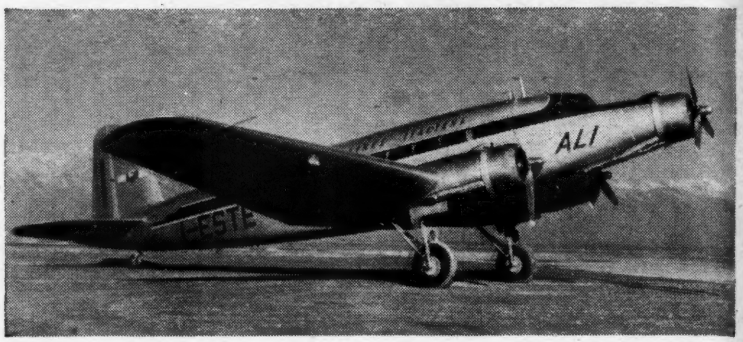
PACIFIC COUNCIL MEETING

DURING December the South Pacific Air Transport Council met in Wellington, New Zealand. Representatives of the U.K., Australia, New Zealand, Canada, Fiji and the Western Pacific High Commission discussed primarily, the purchase of DC-6 aircraft for B.C.P.A. and the site for a permanent international airport for Fiji. The Council was formed to keep under review and promote the development of civil air communications in the South Pacific and to serve as a medium for the exchange of views and information between member countries on civil air transport matters. The Council acts in an advisory capacity to member Governments on all civil aviation matters, and carries out any function which may be delegated to it by the Governments, and also maintains a liaison and co-operates with the Commonwealth Air Transport Council and other organizations.

The meeting agreed that B.C.P.A. should acquire the four DC-6 aircraft which had earlier been purchased by the Australian Government from S.A.S. Four Skymasters with which B.C.P.A. at present operate Pacific services will not be allowed to go out of the South Western Pacific area and in all probability will continue to be based in Australia, but there are

Civil Aviation News . . .

no grounds for a suggestion that they would be taken over by either T.E.A. or N.Z.N.A.C. It would appear that the present international airport at Nandi will be used for a number of years as the airport for Fiji, but a move would probably be made later to Suva Point, the capital. It has been estimated that the construction of an airport there will cost at least £2,000,000. The Council discussed the possibility of operating an air service over the South Tasman Sea, terminating at Harewood, Christchurch, and the New Zealand Government insisted that T.E.A. should be the operator. For such a service landplanes would be necessary and Canadair Fours have been suggested as a possibility. For the first time the Council Meeting was attended by Canadian delegates including the President of C.P.A., Mr. Grant McConachie. From discussions it was evident that C.P.A. intend to co-operate with other British airlines in the area and develop the large potential tourist trade between Canada, New Zealand, and Australia. The Ministry of Civil Aviation was represented on the Council by Mr. F. W. Brooks, Technical officer long-term planning branch; B.O.A.C. by the Chairman, Sir Harold Hartley and Mr. J. W. S. Brancker, Manager, Eastern Division. Among the 92 delegates were the Hon. A. S. Drakeford, Minister of Civil Aviation, Australia; Mr. A. W. Coles, Chairman of B.C.P.A.; Mr. Hudson Fysh, Managing Director of Q.E.A.; and Mr. E. A. Gibson, Director of Civil Aviation, New Zealand.



MONTEROSA: The Fiat G.212 CP, or Monterosa, as used by Avio Linee Italiane, is powered by three 1,215 h.p. Pratt and Whitney Twin Wasp R-1830s. Since long before the war Italian operators have favoured the three-engine formula. The maximum cruising speed is 192 m.p.h. and the normal range 1,490 miles.

FUTURE OF RENFREW

PLANS for the future development of Renfrew Airport, Glasgow, are understood to be conflicting with the plans that the Clyde Trust have put forward for the development of the upper reaches of the river. The increasing size of aircraft and consequent increase in the length of runways necessitates a large amount of land being held for possible extensions of the airport and, moreover, the height of buildings in the immediate neighbourhood must be restricted. It is understood that the Glasgow Corporation Planning Committee doubt whether the advantages of providing air travel facilities for some 60,000 people a year at Renfrew outweigh the handicaps to other development projects. Renfrew, because of limitations in size, could never become an international airport like Prestwick, and Prestwick's greatest handicap, its distance from Glasgow, could be overcome by improved railway services.

CHARTER REVIEW AND PROSPECTS

AMONGST the brokers in particular there is optimism for the future of air charter this year. The tramp aircraft is slowly establishing itself and new cargoes, new methods of stowage and better freight rates made their appearance during last year. One of the most important developments was the experiment of the Baltic exchange of London as the first world air charter market and it has already proved its value to operator and charterer alike. The past year finished with fewer charter operators in the field than at the beginning but those that remain have strengthened their position with work of a contractual nature such as the Berlin airlift, and two months on the Belfast-Lancashire milk flights. Shipments of fruit by air last year showed a marked decrease in tonnage over 1947 due mainly to the restriction of import licences and controlled prices which did not permit the cost of air freight. In the early part of the year, however, numerous consignments of flowers were flown from the South of France to London and the shipping industry made good use of charter aircraft for flying spares and ships' crews. Many more companies interested in developing the export market are now making use of air transport and it is in that field that there is a potential air freight market which is in need of careful research and open to possibilities. The airlines developed special freight services and the introduction of commodity freight rates are considered to be an enticement to shippers to dispatch by air those consignments which would not be large enough to make a special charter economical.

Cargoes of general goods were flown to every part of the world and it is now possible to see definite markets emerging for freight aircraft. Imports are mainly foodstuffs, mostly fruits, with a small percentage of luxury foods and cheap textiles. This market is consequently seasonal and almost entirely from Europe. Exports comprise manufactured goods which may be flown all the year round and remain a steady market. It stands to reason, however, that if manufacturers could be encouraged to fly out more of their goods to European destinations during the seasons when perishable goods are being imported, there could be a reduction in freight rates which would be of immense benefit to the British exporters, the importers and the carriers. There is anxiety about aircraft replacements for the charter operators and the effect on the market. When the wartime conversions become obsolete or too costly to maintain and post-war freighters become available, but at a high cost, the result may necessarily be an increase in freight rates. It will then be a question of the charter operators having sufficient capital to buy high priced aircraft and remain solvent with the amount of work that is likely to be offered.

NOVEMBER EXPORTS AND IMPORTS

	QUANTITIES			VALUE	
	Nov. 1948	Jan.–Nov. 1938	Jan.–Nov. 1948	Nov. 1948	Jan.–Nov. 1948
IMPORTS				£	£
Complete aircraft—number	8	27	61	42,800	2,230,422
Aircraft parts—value ...	—	—	—	412,563	2,840,821
EXPORTS					
Complete aircraft—number					
To Eire	—	—	7	—	7,200
Union of South Africa	15	33	63	146,900	532,394
Southern Rhodesia ...	2	*	10	3,542	170,003
India, Pakistan, etc. ...	4	11	45	6,660	772,824
New Zealand ...	2	44	30	19,416	354,503
Canada	—	—	97	—	1,312,016
Other British Countries	6	83	61	61,610	588,798
Sweden	5	22	16	26,750	110,658
Norway	—	*	19	—	270,714
Denmark	6	*	32	18,700	67,150
Belgium	9	16	87	23,277	373,127
France	5	29	67	22,000	626,310
Switzerland	—	*	6	—	5,331
Portugal	—	31	17	—	142,970
Greece	—	*	29	—	205,900
Turkey	—	14	75	—	425,550
Argentine Republic...	10	*	117	145,666	3,929,101
Other Foreign Countries	7	182	193	63,407	2,297,861
Total	71	465	971	537,928	12,192,421
Aircraft engines—number					
To Eire	2	*	51	6,408	164,624
India, Pakistan, etc. ...	21	47	83	49,347	255,481
Australia	7	38	55	17,850	114,215
Canada	3	134	111	11,700	520,642
Other British Countries	13	104	165	32,386	395,187
Sweden	3	*	9	5,878	103,357
Spain	—	—	10	—	32,158
Italy	5	*	60	14,539	111,334
Turkey	—	*	7	—	12,332
United States of America	—	*	1	—	6,147
Argentine Republic...	7	—	247	24,816	525,116
Other Foreign Countries	59	467	417	124,552	672,042
Total	120	790	1,216	287,476	2,912,635

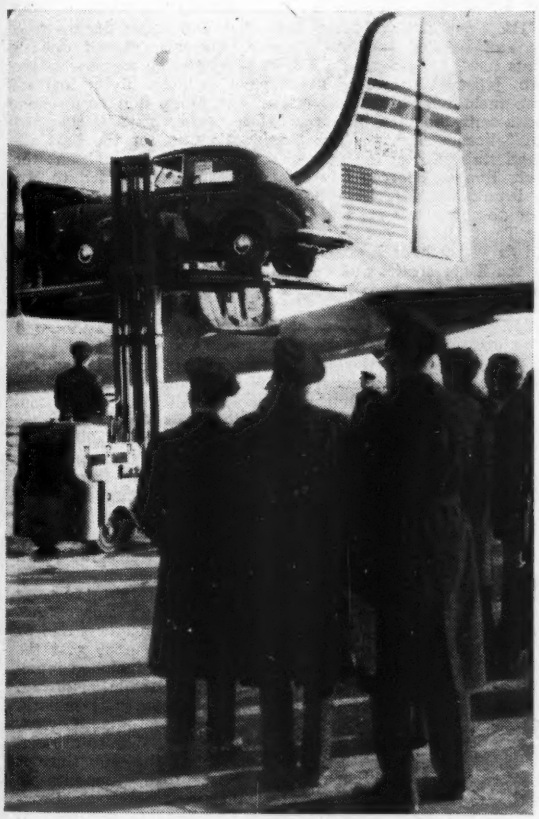
* Included in "Other British Countries" or "Other Foreign Countries" in 1938.

BRITISH DIMENSIONAL UNITS

THE United Kingdom has selected and will use the blue table in all messages containing dimensional units transmitted on the air-ground channels in the aeronautical telecommunications service. In *Flight*, May 27th, 1948, a table with five alternatives of dimensional units was published, four of which were identified by a colour and the fifth was the I.C.A.O. recommendation. The ultimate aim is to introduce in ten years the I.C.A.O. table of units to eliminate the inconvenience and hazard caused by the use of different systems of measurement. Tables will be employed up to given dates and it is necessary for each user to indicate which table is in use.

1948 IN THE U.S.

ALTHOUGH American airline operators handled a gross revenue of £160,885,500 during 1948 the majority continued to lose money. Passenger traffic throughout the year was slightly less than in 1947 but the quantity of mail, express and freight carried increased by nearly 50 per cent. The American Air Transport Association has estimated that the losses for 1948 may have dropped to about £1,683,750 sterling, which is approximately one-third of the deficit in 1947. The internal airlines carried 9,128,230 passengers in the first nine months of 1948, a decline of 194,000 over the same period in 1947. The domestic fleet increased by 118 to 862 aircraft and the fleets of international operators increased from 173 to 197 aircraft. Up to the beginning of December there had been only 96 people killed in four accidents compared with 216 in five accidents in 1947. It is estimated that the fatality rate last year would probably work out at 1.5 per 100,000,000 passenger miles. The number of pilots in the U.S. flying privately, and on irregular and scheduled services rose to 433,241, an increase of 33,000 over the previous year, and there were 97,000 civil aircraft registered in the country. During 1948 900 civil airfields were added to the airways system bringing the total to 5,938. The aircraft industry generally ended the year with a profit but it is said that profits were not enough to offset losses of the previous two years. Commercial aircraft output declined to 170 in 1948 compared with 280 in 1947, and so far 135 aircraft are on order for 1949.



FLYING THE SAMPLE: This 1949 Morris Minor left London Airport on January 3rd for New York and was the first civil motor car to fly the Atlantic. It was carried in the Pan American Airways DC-4 freighter which flies across the Atlantic twice a week from New York through London to Brussels where it connects with another freighter to Stuttgart, Munich and Prague. One service returns and the second flies New York, London, Brussels, Stuttgart, Istanbul to Damascus. After January 12th that service will be extended to Basra.

S.L.A.E. EXPANSION

A BRANCH of the Society of Licenced Aircraft Engineers has been formed in the Bournemouth area to cover licenced engineers at the B.O.A.C. base at Hurn, Airspeeds at Christchurch and Flight Refuelling at Blandford. Mr. Peter Locke, of Dowty Equipment, Ltd., and Mr. Mitchell, of Normalair, Ltd., have already given interesting lectures to Branch members, and the Airspeed factory at Christchurch has been visited. To increase the Society's activities in Scotland a new Branch has been formed at Prestwick. The Society's Scottish Area Council had previously been responsible for the district, but the scope of that Council is now being extended to cover Cumberland and the Glasgow and Perth areas. A new branch was formed in Dublin on December 9th at a meeting of the maintenance engineers at Collinstown Airport. Instructional classes for student members and a series of technical lectures have been planned. There are now 14 branches of the Society in the U.K. and five overseas, in Southern Rhodesia, Singapore, Cairo, Montreal and Dublin.

BREVITIES

It was recently announced by the Portuguese Minister of the Interior that about £8,000,000 are to be spent on building airfields in Madeira.

* * *

With the introduction of summer schedules on April 5th K.L.M. hope to fly the London-Amsterdam service with Convair 240s. Five services a day are flown at present with DC-3, DC-4 and occasionally DC-6 aircraft.

* * *

The provisional estimated total number of passengers carried by B.E.A. during 1948 amounts to 565,000 compared with the figure of 467,000 carried during 1947. Of these 565,000 passengers 369,000 were carried on internal services within the U.K. and Channel Islands, and 196,000 passengers were carried on the Continental services of the Corporation.

* * *

Negotiations have been completed to allow Hong Kong Airways, Ltd., an associate of B.O.A.C., to fly scheduled services with flying boats to Manila. The flying boats will land in Manila Bay and will have the use of the facilities of the Philippine Naval Patrol Base for passengers and cargo. The service is expected to start early this year.

* * *

Notice to Airmen No. 452 announces the opening of three more airfields for use by civil aircraft. Spalding can now be used with the prior permission of the owner. Swanton Morley and Wellesbourne Mountford are available only to aircraft operating on charter services.

* * *

The Board of Administration of the States of Guernsey has undertaken responsibility for Alderney airfield, to be exercised through the Airport Commandant, Guernsey Airport. Aircraft may not land or take off from Alderney without prior permission from Guernsey and landing will be limited to aircraft with an all-up weight of less than 11,000 lb.

* * *

British South American Airways aircraft flew 429,040 miles in November, 1948, and carried 1,698 passengers. 62.8 tons of mail and cargo were carried and the route miles in operation were 21,167. In the first eleven months of flying over the Miami route, 2,561 passengers and more than 23 tons of mail were flown.

* * *

Agreement has been reached between the Ministry of Civil Aviation and B.E.A. on technical measures necessary to ensure regularity of air services all the year round into Turnhouse Airport, Edinburgh. These measures include certain navigational aids, some of which are already installed and the rest of which will be ready before the normal reopening of the Turnhouse services in the spring. As an extra precaution a length of ground at the south-east end of the main instrument runway will be consolidated so as to obviate any danger of an aircraft over-running in bad weather.

* * *

American Overseas Airlines' operating figures for 1948 show that a profit of over £250,000 was made and that more than one-fifth of the North Atlantic air passengers were carried by the company. During 1948, on transatlantic operations, A.O.A.

Civil Aviation News . . . . .

carried 71,000 passengers, more than 900 tons of cargo and 516 tons of mail. On the Berlin airlift alone, between Frankfurt and Berlin, 13,870 passengers, nearly 3,000 tons of cargo and 122 tons of mail were flown.

* * *

Lord Pakenham, Minister of Civil Aviation, recently visited Holland at the invitation of the Netherlands Government to inspect Dutch Civil Aviation. Accompanied by Dr. D. Goedhuis, Civil Air Attaché to the Netherlands Embassy, and the General Manager of B.E.A. Continental Services, Mr. A. H. Milward, Lord Pakenham flew by B.E.A. to Schiphol on January 4th and returned by K.L.M. Convair on January 6th.

* * *

A survey party headed by Mr. W. M. Hargreaves, Director of Navigational Services (Aerodromes), is in South America making a detailed study of possible flying-boat bases for the B.S.A.A. SR 45 services. The party consists of four representatives of the M.C.A., two of B.S.A.A. and one of Saunders-Roe, Ltd., and they will remain in the area for two to three months.

* * *

The Ministry of Civil Aviation have announced that the G.C.A. is now in operation at Belfast Airport, Nutts Corner. Approach and over-shoot procedures are given in Notice to Airmen No. 448. Notice that signals will be displayed at Naval Air Stations to indicate that "Carrier Procedure Training" is in progress is contained in Notice to Airmen No. 447.

* * *

During the twelve months July, 1947, to June, 1948, Trans-Australia Airlines increased their fleet from 15 passenger aircraft to 21 passenger aircraft and four freighters. The fleet at the end of June, 1948, consisted of three DC-4, 18 DC-3 passenger aircraft, and four DC-3 freighters.

* * *

Bremen Airport, which was closed last June by the U.S. Army, was re-opened as an international civil airport operated by the Military Government on January 11th. At present the airfield can only accommodate twin-engined aircraft of the Dakota class, but improvements including installation of radio facilities, lighting systems, and runway extensions are contemplated.

* * *

Provisional statistics for the year 1948 show that Aer Lingus carried 180,470 passengers, compared with 132,416 in 1947. Over 1,000 tons of freight and about 70 tons of mail were carried, more than double the amount in the previous year. During 1948 11,908 flights were made, covering a distance of 2,542,783 miles. The passenger load factor on the Dublin-London service, referred to in *Flight*, December 16th, 1948, was 63.5 per cent, and not as printed.

FROM THE CLUBS

A SERIES of lectures has been organized by the Derby Aero Club to fill the remainder of the winter evenings. The syllabus has been compiled with a view to making enthusiasts more familiar with meteorology and navigation since these subjects are embraced in the new licensing regulations for private pilots. Although adverse flying conditions have seriously curtailed air activities recently, members enjoyed a most successful Christmas party on the evening of December 23rd, and the New Year was "seen in" in traditional fashion at an enjoyable dance held in the clubhouse.

* * *

ITS third year of post-war operation was completed by the Cambridge Aero Club on December 31st. During the year the flying of the club Tiger Moths and Austers totalled 1,407 hours and 12 members made their first solo flights. "A" licences were obtained by 11 *ab initio* and also a number of ex-Service members. Night flying and instructional training were carried out by the more experienced members. Flying instruction was given to numerous A.T.C. Cadets of 104 (Cambridge) Squadron, which was made available by Mr. A. G. G. Marshall, the managing director of Marshall's Flying School. The most outstanding Cadet, F/Sgt. Bing, received a flying scholarship up to "A" licence standard. At the three "At Homes" which were held at Cambridge during the year, club members competed with No. 22 Reserve Flying School in the flying contests and achieved encouraging results. Amongst the extensive private owners' flights, both in this country and on the Continent, one of the most notable flights was that of Mr. Hersee, who went as far as North Africa in his Gemini. At the 1948 children's Christmas party Santa Claus was enthusiastically welcomed upon his arrival in a Gemini.

* * *

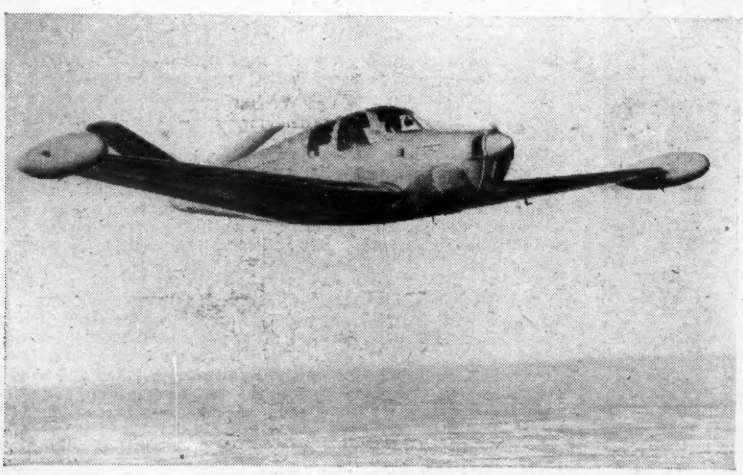
THE East Riding Flying Club flew 600 hours during 1948 and besides 15 "A" licence renewals, passed out 16 pilots for "A" licences. The youngest flying member of the club, Jeffrey Mann, aged 15½, logged 30 hours' flying instruction, including aerobatics, instrument flying and navigation, and awaits his 17th birthday before taking his first solo and "A" licence flights. The President's Cup for the best all-round club pilot of the year was won by Mr. D. Jackson; the navigation and forced landing trophies were awarded to Mr. R. Frank and Mr. L. Wilson respectively. Membership of the club now totals 192 and the fleet consists of five Austers and one Tiger Moth. A revision of flying charges has been made and £2 5s per hour is charged for the Austers and £3 per hour for the Tiger Moth; block flying may be purchased at £1 15s per hour for a 20-hour block.

* * *

THE first of a series of lectures on navigation and meteorology at the West London Aero Club was given by Mr. Philip Wills, the well-known glider pilot, in December. Capt. H. Winch, a member of the Household Brigade Flying Club which is attached to the West London club, took off for Australia in his Gemini on December 31st. The club reports very satisfactory progress during the winter, with the instructors being kept busy whenever weather has been suitable for flying.

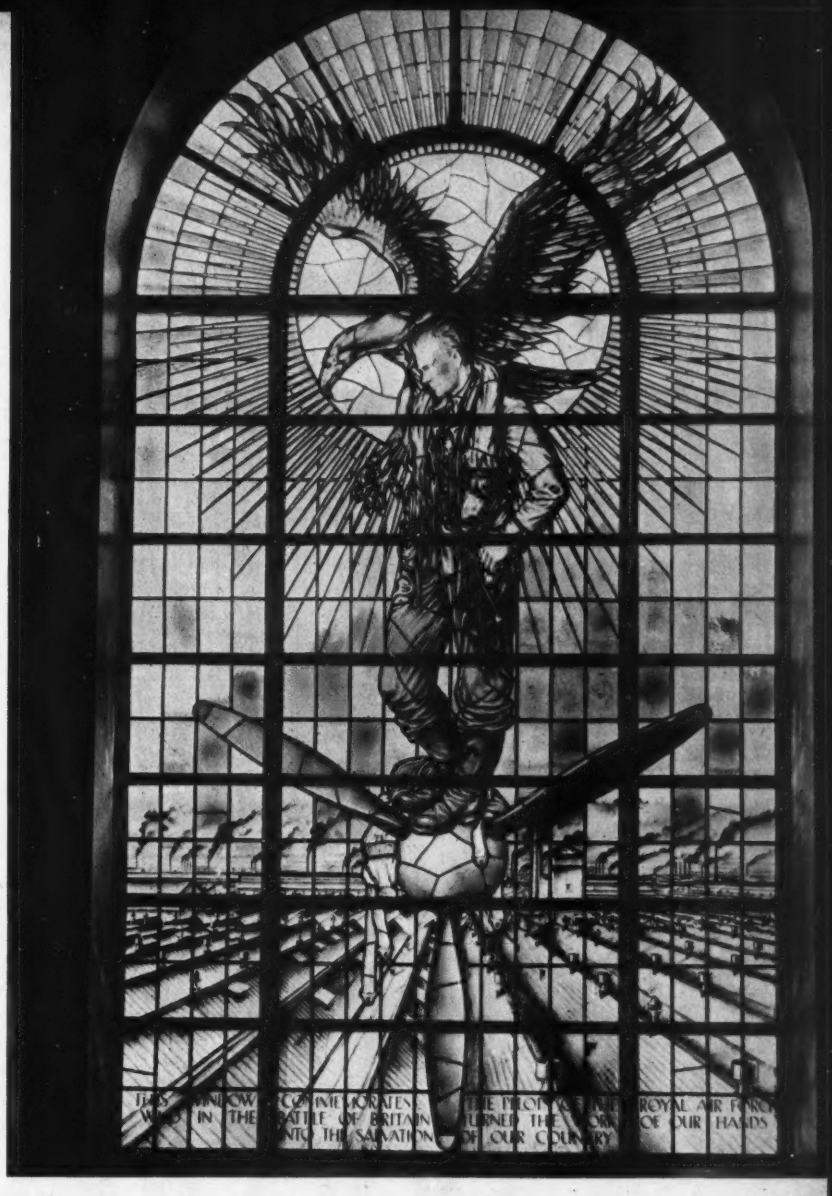
* * *

FLYING hours at the Herts and Essex Aero Club during December amounted to 139, making the 1948 total up to 3,052 hours. During 1948 26 new "A" licences were gained by members and 67 were renewed. On December 31st the membership was 320 and included representatives of Aden, Canada, Norway, Holland, Trinidad, Australia, Denmark, Italy, France, Greece, India, Ceylon, Switzerland and Cyprus. The total number of hours flown by the club since it reopened in May, 1946, amounts to 8,063. The private owners at Broxbourne possess two Geminis, two Messengers, four Austers, a Mohawk, a Proctor, a Leopard Moth and a Rapide, all of which are serviced and maintained by the club, which uses its Rapides and Proctors for regular charters and freight flights. The new hangar replacing the one destroyed by fire in June, 1947, has now been completed.



LONG RANGE: On a trial flight from the Wichita, Kansas, Airfield of the Beech Aircraft Company, a Bonanza specially fitted with long-range tanks. Captain Bill Odom is attempting to fly the 5,010 miles from Honolulu to New York in an attempt to break the record for a non-stop flight in a light aircraft.

UNITED THEY STOOD



THE inscription at the base of the memorial reads: "This Window Commemorates the Pilots of the Royal Air Force who in the Battle of Britain turned the work of our hands into the Salvation of our Country."

ON the afternoon of Tuesday, January 11th, a most illustrious gathering assembled in Derby to honour the men who took part in the Battle of Britain. The occasion was the unveiling of the Rolls-Royce Memorial Window by the Chief of Air Staff, Marshal of the Royal Air Force, Lord Tedder, G.C.B. The ceremony took place in the presence of representatives from among His Majesty's Ministers and Members of Parliament, members and ex-members of the Air Council, Air Officers Commanding, and very many Battle of Britain officers, including Air Chief Marshal Lord Dowding of Bentley. Present also were representatives of the Admiralty, Anti-Aircraft Command, Royal Observer Corps, Diplomatic Corps and Ministries.

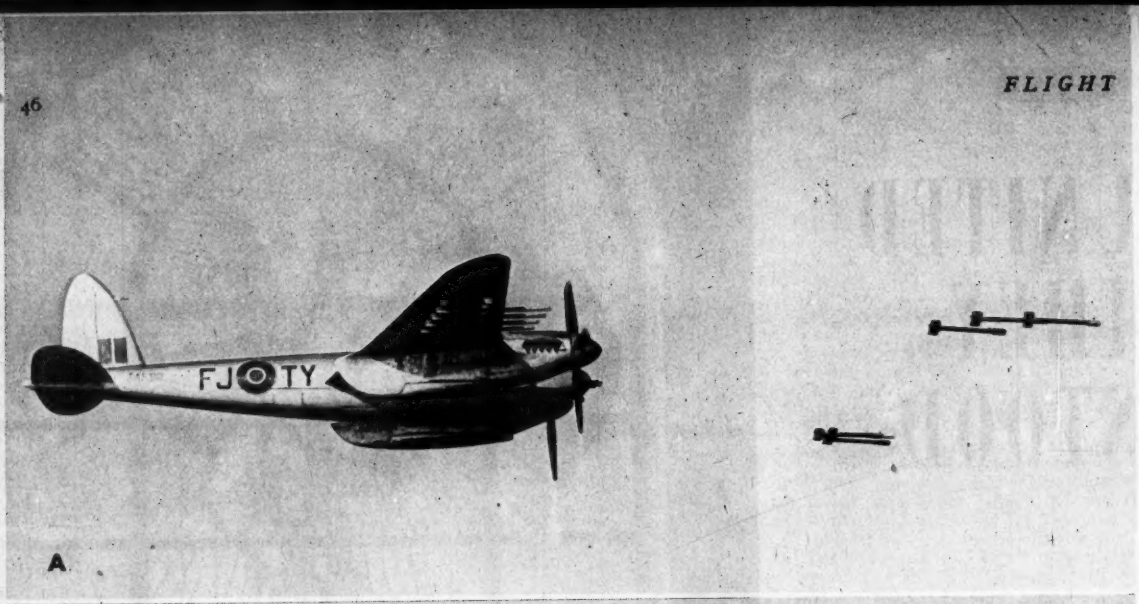
The large and beautiful memorial window is the work of Mr. Hugh Easton who also designed the Battle of Britain window in Westminster Abbey. Mr. Easton describes his window in these words:

"In the centre of the window stands the figure of a typical fighter pilot of the Royal Air Force. Ready for battle, in flying boots and 'Mae West,' his helmet in his hand, he stands on the spinner of an airscrew, its three blades dominating the lower part of the window. Behind it are stretched out in long lines the sheds and buildings of the Derby factory which produced these engines with which the pilots won the Battle of Britain. In the lower part, therefore, I have tried to symbolize the work of man's hands, the machine or, one might say, the structure, the bones and muscles. In the centre, I felt, the pilot should represent the brain. Above and behind him, with outstretched wings, ready to strike, is a golden eagle; here is the heart and spirit. Beyond, and framing the eagle and dominating all the top of the window, is the resplendent sun in all its glory, symbol of that for which the Battle was fought, and towards which humanity lifts up her eyes."

While pilots fought over the English Channel and East Anglia a battle of production was being waged and won in Derby and elsewhere. From 13,000 men in January, 1940, the numbers engaged in producing Merlins for the Spitfires and Hurricanes increased by September to 17,500. Output leaped from 350 to 700 engines per month. Frequently men put in 80 working hours in a week, normal hours then being 47. In the flight section at Hucknall a hundred complete Hurricanes were repaired during the few months of the Battle.

The exhortation of the Rolls-Royce "commanding officer," Mr. E. W. Hives, C.H., M.B.E., to his men, "Work until it hurts," was obeyed as if it were an order given in the field.

(*A list of those who accepted invitations to be present is printed on page* 49.)



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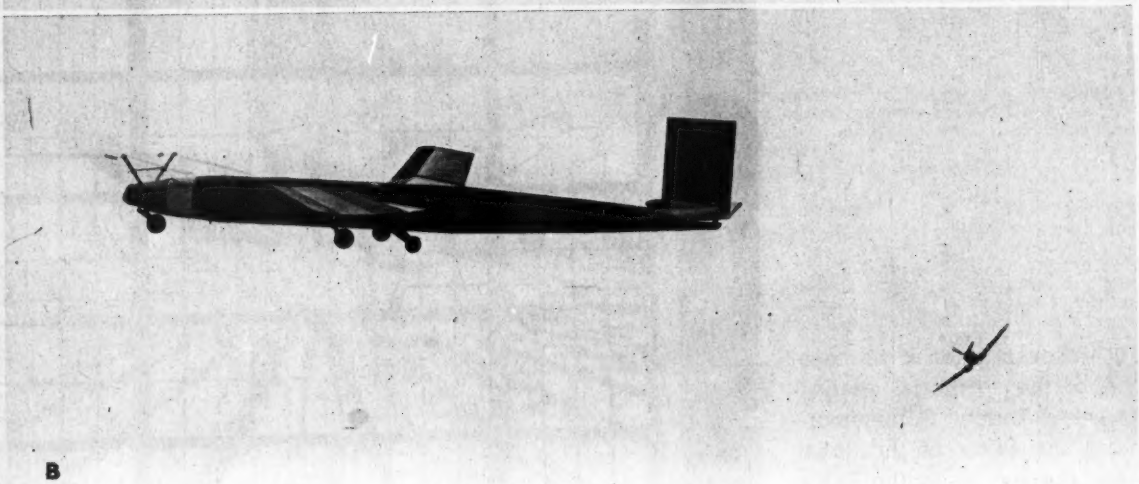

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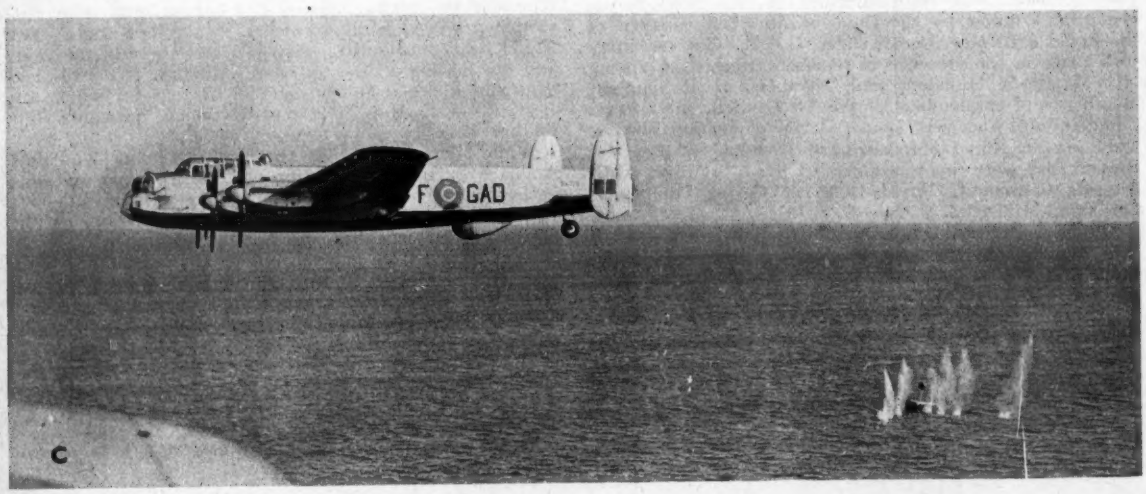
ARMAMENT IN AC



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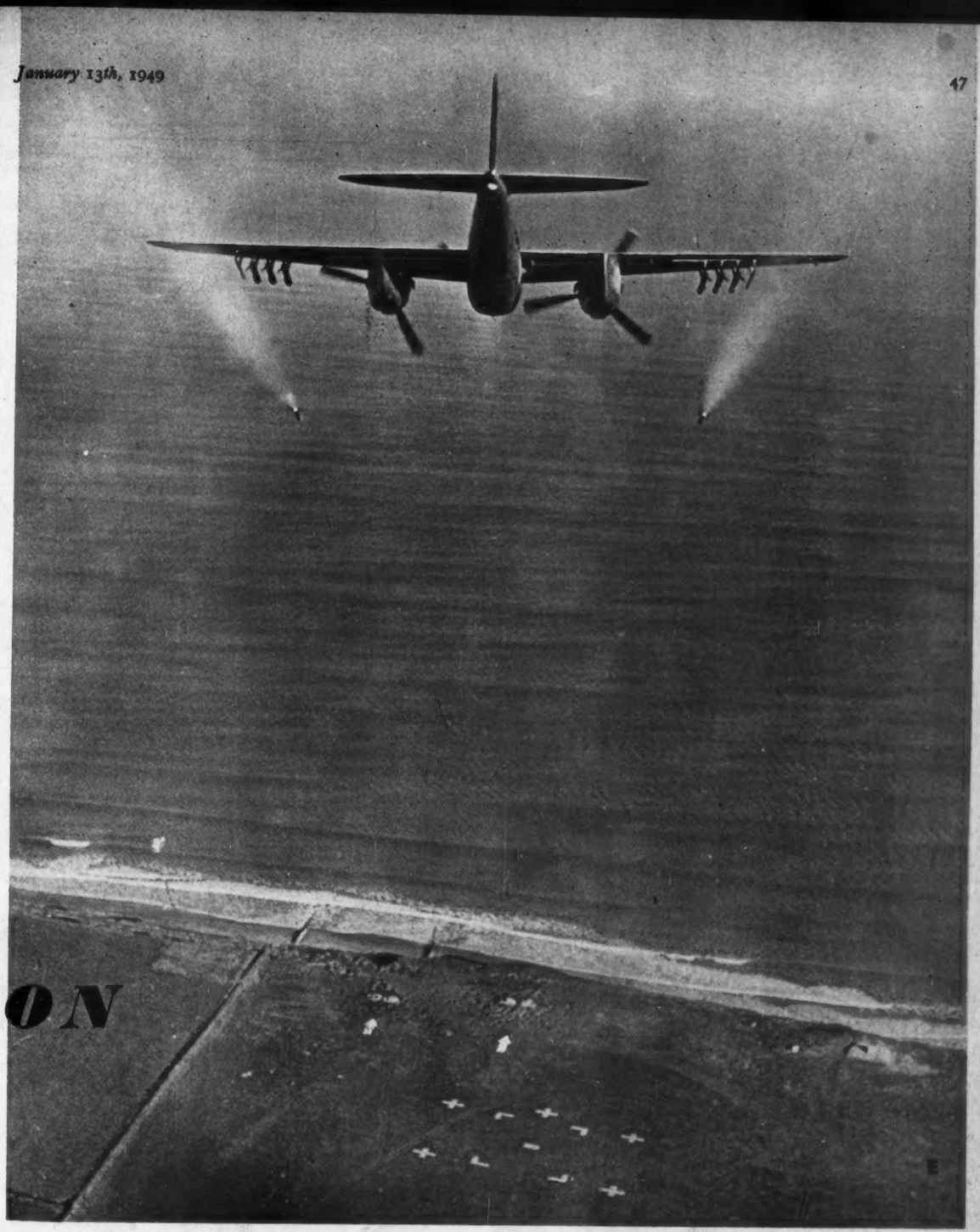


ATION

AFFILIATED to the Empire Air Armament School at Manby, in Lincolnshire, (Commandant, A/Cdre. J. G. Franks), the Central Gunnery School, Leconfield, is responsible for instructing pilots in the technique of air-to-ground and air-to-air attacks. These duties are exemplified by the views on the opposite page showing (A) a Mosquito discharging six rocket projectiles and (B) a Spitfire closing in on a towed target. The large picture on this page is, perhaps, unique in that, not only is the attacking aircraft seen at close range at the moment of discharging RPs, but the target —one of the two pairs of tanks beyond the ground arrows—is also clearly visible. It was secured by S/L. Parker, of the Air Ministry, through the windscreen of a Mosquito.

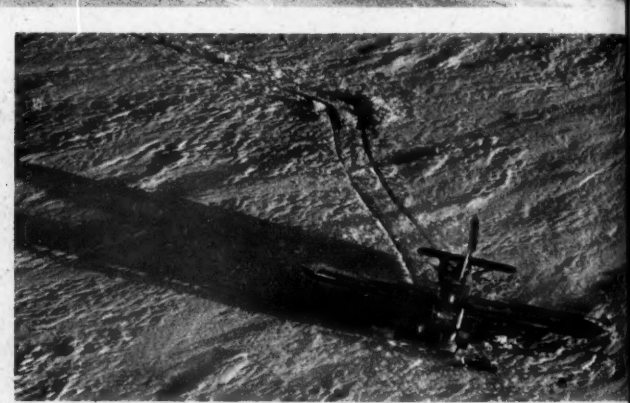
The smaller view (D), on this page, depicts the loading-up of RPs with live heads.

Opposite, the tail-gunner of a Lancaster is getting in some good work on a moored target with his twin 0.5in guns.

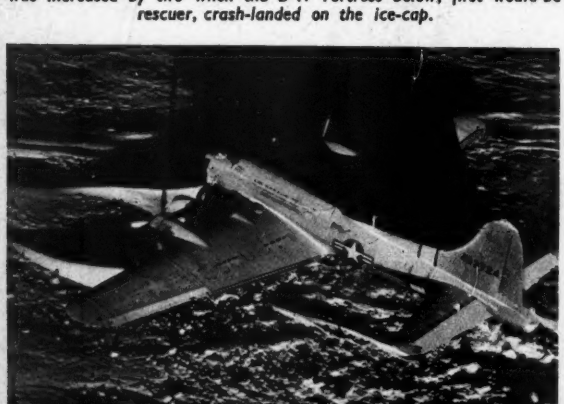
ARCTIC RESCUE

The U.S. Air Force Dakota which force-landed on a 7,500ft-high Greenland ice-cap on December 9th.

The Piasecki H3P-1 helicopters above, on the flight deck of the carrier "Saipan," were to have taken part in the U.S. Navy's share of the rescue attempts. Their voyage was rendered unnecessary, however, by the U.S.A.F.'s final bid on December 28th. The number of stranded men was increased by two when the B-17 Fortress below, first would-be rescuer, crash-landed on the ice-cap.



Seen above is one of two gliders with which unsuccessful "snatch" rescue attempts were made. (Below) Nine of the 12 rescued airmen after landing at the U.S.A.F.'s base at Bluie West One, Greenland. The successful rescuing aircraft was a ski-equipped Dakota which made a rocket-assisted departure from the ice-cap.



THE FEW AND THE MANY

Derby Honours the Pilots of the Battle of Britain

LAST Tuesday, January 11th, a memorial window was unveiled at the Rolls-Royce works at Derby by Marshal of the Royal Air Force The Lord Tedder, Chief of the Air Staff. The window, a picture of which appears on p. 45, was designed by Mr. Hugh Easton, who designed the Battle of Britain window in Westminster Abbey. It symbolises the way in which Rolls-Royce workers gave the R.A.F. one of the tools for finishing the job: the Merlin engine The ceremony was attended by a large and distinguished gathering, those who had accepted invitations including:

Ministers, former Ministers and Members of Parliament:

The Rt. Hon. Sir Stafford Cripps, K.C., M.P.
The Rt. Hon. P. J. Noel-Baker, M.P.
The Rt. Hon. Sir Archibald Sinclair, K.T., P.C., C.M.G.
The Rt. Hon. Lord Balfour of Inchrye, P.C., M.C.
G/C. C. A. B. Wilcock, C.B.E., A.F.C., M.P.

Present and Past Members of the Air Council:

Marshal of the Royal Air Force The Viscount Trenchard, G.C.B., G.C.V.O., D.S.O., D.C.L., LL.D.
Marshal of the Royal Air Force The Viscount Portal of Hungerford, K.G., G.C.B., O.M., D.S.O., M.C.
Marshal of the Royal Air Force The Lord Tedder, G.C.B.
Air Chief Marshal Sir Roderic Hill, K.C.B., M.C., A.F.C.
Air Chief Marshal Sir Wilfred R. Freeman, G.C.B., D.S.O., M.C.
Air Marshal Sir Hugh W. L. Saunders, K.B.E., C.B., M.C., D.F.C., M.M.
Air Marshal Sir George C. Pirie, K.B.E., C.B., M.C., D.F.C.
Air Marshal Sir R. Victor Goddard, K.C.B., C.B.E.
Air Marshal Sir Arthur P. M. Sanders, K.B.E., C.B.
Air Marshal Sir W. Alec Coryton, K.B.E., C.B., M.V.O., D.F.C.

Air Officers Commanding:

Air Chief Marshal Sir James Robb, K.B.E., C.B., D.S.O., D.F.C., A.F.C.
Air Marshal Sir A. B. Ellwood, K.C.B., D.S.C.
Air Marshal Sir J. W. Baker, K.C.B., M.C., D.F.C.
Air Marshal Sir Brian E. Baker, K.B.E., C.B., D.S.O., M.C., A.F.C.

Battle of Britain Officers:

Air Chief Marshal Lord Dowding of Bentley, G.C.B., G.C.V.O., C.M.G.
Air Marshal Sir William Elliot, K.B.E., C.B., D.F.C.
A.-V.M. G. A. Bouchier, C.B., C.B.E., D.F.C.
A.V-M. S. F. Vincent, C.B., D.F.C., A.F.C.
A.V-M. J. D. Breakey, C.B., D.F.C.
A.V-M. Sir Basil E. Embry, K.B.E., C.B., D.S.O., D.F.C., A.F.C.
A.V-M. G. Harcourt-Smith, C.B., C.B.E., M.V.O.
A.V-M. C. V. R. Pelly, C.B.E., M.C.

Air Commodores:

D. F. W. Atcherley, C.B.E., D.S.O., D.F.C.
A. D. Warrington-Morris, C.B., C.M.G., O.B.E.

Group Captains:

D. R. S. Bader, D.S.O., D.F.C.
J. Bajan.
L. Crocker
E. M. Donaldson, D.S.O., A.F.C.
P. Gleave, O.B.E.
W. J. Leather, D.F.C.
R. B. Lees, C.B., C.B.E.
F. L. White.

Wing Commanders:

R. Adams, O.B.E.
R. Berry, D.S.O., O.B.E., D.F.C.
M. V. Blake, D.S.O., D.F.C.
G. A. Brown, D.F.C.
A. M. Campbell.
W. G. Clouston, D.F.C.
R. G. Dutton, D.S.O., D.F.C.
D. O. Finlay, D.F.C., A.F.C.
J. Fleming, M.B.E.
E. Graham.
C. F. Gray, D.S.O., D.F.C.
E. J. Gribben, O.B.E.
Barrie Heath, D.F.C.
L. Jessop.
A. V. R. Johnstone, D.F.C.
C. B. F. Kingcome, D.S.O., D.F.C.
J. A. Leathart, D.S.O.
R. C. Love, D.S.O., D.F.C.
H. J. Maguire, D.S.O.
J. S. McLean, O.B.E., D.F.C.
J. A. O'Neill, D.F.C.
R. P. Powell, D.F.C.
P. H. M. Richey, D.F.C.
A. Rook.
H. a'B. Russell, D.F.C.
E. H. Thomas, D.S.O., D.F.C.
G. H. Westlake, D.S.O., D.F.C.
A. Wilkinson, D.S.O.
D. S. Wilson-Macdonald, D.S.O., D.F.C.

Squadron Leaders:

F. H. Bowyer, M.B.E., J.P.
A. V. Clowes, D.S.O., D.F.M.
V. G. Daw, D.F.C., A.F.C.
P. K. Devitt, D.F.C.
W. Duncan-Smith, D.S.O., D.F.C.
H. Dundas, D.F.C.
A. F. Eckford, D.F.C.
C. R. A. Forsyth, D.S.O.
R. Haine, D.F.C.
R. E. Havercroft.
J. A. Hemingway, D.F.C.
L. F. Henstock.
F. D. Hughes, D.S.O., D.F.C.
P. Hugo, D.S.O., D.F.C.
D. A. C. Hunt.
R. G. Kellett, D.S.O., D.F.C.
P. Matthews, D.F.C.
R. McGugan.
R. R. Mitchell, M.B.E., D.F.C.
C. O. J. Pegge, D.F.C.
H. A. Pippard.
J. E. Proctor, D.F.C.
A. J. Roberts, D.F.C.
Scott-Malden, D.S.O., D.F.C.
D. G. Smallwood, D.S.O., D.F.C.
E. P. Wells, D.S.O., D.F.C.
A. R. Wright, D.F.C., A.F.C.
J. Zumbach.

Flight Lieutenants:

James Lacey, D.F.M.
A. G. McIntyre.
G. L. Nowell, D.F.M.
J. B. Wingate.

Admiralty, Anti-Aircraft Command, Royal Observer Corps and Ministries:

Major G. P. Bulman, C.B.E.
G/C. W. G. Cheshire, C.B.E.
Brig B. Chichester-Cooke, C.B.E., T.D., D.L.
Vice-Admiral G., E. Creasey, G.C.B., C.B.E., D.S.O., M.V.O.
A.V-M. E. J. Cuckney, C.B., C.B.E., D.S.C.
Mr. F. A. Foord.
A. Cdre. H. P. Fraser, C.B.E., A.F.C.
Observer Capt. W. G. Hanson.
Maj. Gen. L. K. Lockhart, O.B.E., M.C.
Sir Ben Lockspeiser.
Capt. M. Luby.
Mr. S. T. L. Mansell.
Col. S. R. Moss-Vernon, M.C., T.D., D.L.
Mr. F. C. Musgrave.
A. Cdre. H. L. Patch, C.B.E.
Mr. W. G. A. Perring.
Mr. E. L. Pickles, C.B., O.B.E.
Sir Archibald Rowlands, G.C.B., M.B.E.
Mr. S. Scott-Hall.
Mr. J. E. Serby.
A. Cdre. W. E. Staton, C.B., D.S.O., M.C., D.F.C.
Observer Commdr. A. R. Tuxford, O.B.E.
Air Marshal Sir Hugh Walmsley, K.C.I.E., C.B., C.B.E., M.C., D.F.C.
Maj. Gen. R. F. E. Whittaker, C.B., C.B.E., T.D.

Diplomatic Corps, etc.:

Col. J. B. Ackerman.
Col. H. F. C. Holtz.
A. Cdre. J. L. Hurley, C.B.E.
A. Cdre. S. T. Karpinski.
A. Cdre. E. G. Knox-Knight, O.B.E.
Capt. Ch. Mertens.
Lt. Col. V. Srom.
Col. P. Stehlin, O.B.E.

Other Guests:

His Worship the Mayor of Derby.
The Right Rev. the Lord Bishop of Derby.
The Right Rev. the Provost of Derby.
W/C. J. M. Aiton.
Mr. R. W. Harvey Bailey.
Air Chief Marshal Sir Norman H. Bottomley, K.C.B., C.I.E., D.S.O., A.F.C.
Mr. P. W. S. Bulman, C.B.E., M.C., A.F.C.
Mr. S. Camm, C.B.E.
Lt. Col. M. Ormonde, Derby, O.B.E.
Mr. John de Looze.
Sir Roy Dobson, C.B.E., J.P.
Mr. Hugh Easton.
A. Cdre. A. D. Gilmore, C.B.E.
Mr. H. C. Hall, O.B.E.
Major Sir Hew Kilner.
Mr. J. D. North.
Mr. W. E. Peskett.
Col. R. L. Preston, C.B.E.
Mr. J. K. Quill, O.B.E., A.F.C.
Col. H. Rawlings.
Mr. A. J. Rowledge.
Air Marshal Sir Robert H.M.S. Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
Mr. J. Smith, C.B.E.
Air Marshal Sir Ralph S. Sorley, K.C.B., C.B.E., D.S.C., D.F.C.
Sir Robert Watson-Watt, C.B., LL.D., D.S.C., F.R.S.
The Rev. R. L. Watts.

Nothing To It

First General Outline of a New Pilot Aid of Utopian Promise

IN the December 18th issue of that famous American magazine, *The Saturday Evening Post*, there appears an article written by Captain Hiram W. Sheridan, of American Airlines, regarding a new Sperry instrument which he recently tested on behalf of the Air Line Pilots' Association. We have read this article with extreme interest; and, taking the view that Captain Sheridan has presumably no Sperry axe to grind and, as an air line pilot of considerable experience therefore inclines toward the sceptical in appraising any new device, we reason that the eulogistic tenor of his article is of real significance.

The new instrument is called the Zero Reader, and the American Sperry Gyroscope Company have been working on it for some considerable time. Although the tone of Capt. Sheridan's article is laudatory there are few technical bones in the meat, and we can therefore do no more than give a very brief resumé of what the instrument does; when factual details are available we shall, of course, give a detailed analysis.

In appearance the Zero Reader has a face diameter of about 3 inches, behind which is a black back-plate carrying at its centre a miniature silhouette image of an aircraft. Vertical and horizontal cross-wires sweep the face, and the back-plate carries a meridian and equator which intersect at the miniature aircraft. Briefly, the cross-wires are actuated by signals from a gyroscope which detects pitch and roll, so that the instrument can be regarded as a type of artificial horizon, and it is quite possible to fly on the instrument in the orthodox manner. However, by feeding in other signals, e.g., from a Gyrosyn compass, radio altimeter, or from a blind approach system such as I.L.S., it is possible to hold any course, any altitude, or any approach path by "zero-ing," that is to say, by keeping the cross-wires intersected on the aircraft image.

Error Neutralized

In broad terms it can be stated that the Zero Reader measures how far you are from where you want to be. It does not indicate what the error is, as a compass might, but simply neutralizes the error at a calculated rate. The pilot does not need, or want, to know what the rate is. This function has the important effect that when, for example, a new course is selected (and from the time of the selection) disparate signals are fed into the instrument from the Gyrosyn compass, and the meridian cross-wire will appropriately be displaced from centre either to the right or left accordingly as the new course is to port or starboard of the extant heading. All the pilot then has to do is to initiate the correction motion in the normal manner, and at once the meridian line will zero, and as long as the pilot keeps the line on zero the aircraft will curve on to the right path. By the same token, this will occur in pitch as well as in yaw.

Capt. Sheridan states that the Zero Reader is, in effect, a re-write of automatic approach control with an autopilot. In an automatic let-down a detection monitor feeds signals to tiny motors which control the aircraft. The Zero Reader has detection monitoring but no motors; it puts its signals into the cross-wires and the human pilot reads and does his own control.

"Zero Readers will make air travel safer," Capt. Sheridan emphasizes. "They will make airline schedules as reliable in winter as in summer. In consequence, the airlines will make money. If that is not revolutionary I will swallow those annual financial reports, red ink and all."

It will be possible, although perhaps not desirable, to dispense with the normal blind flying panel instruments in favour of the Zero Reader. This is not to say that the conventional instruments will not be installed: it merely suggests that they may be displaced from their present cardinal positions to less important sites. The mechanisms of the various instruments will be required, of course, as sources of supply for signalling the Zero Reader, but the individual instruments *qua* indicating devices could be a secondary function.

This is a matter of enormous importance in that it would allow canalizing the diverse sources of information which are at present tapped by the pilot, and therefore would make a considerable part of his job very much more simple.

Certainly it is early as yet to prophesy the trend of change consequent upon the advent of the Zero Reader, but pilots have for so long wished for some device just such as this that, if it does everything for which it was designed—and Capt. Sheridan, at least, seems completely convinced—then the impact on pilot practice must inevitably be considerable indeed.

It is, however, always advisable to look at the black side of the picture—not necessarily to dwell on it, but at least to appreciate that it is there. Man is a very clever animal and achieves many wonderful things, but Nature remains unchanged, and when she shows her strength even the mightiest of man's achievements are made to tremble.

Electrical, radio, radar and electronic devices can and, probably, always will, be "blown," "burnt-out," or "scuppered" by electrical activity in the atmosphere, and although elaborate precautionary measures can be taken to mitigate the effects, complete immunity is, perhaps, as physically impossible as perpetual motion.

That being so, it seems advisable, to say the least, that pilots and navigators should always have a *working* knowledge of the old stick-and-string flying and astro-fixing methods, if only to get home safely when all the wonderful modern devices have been made unreliable by Acts of God.

NEW YEAR HONOURS

(*continued from page 23, January 6th*)

ROYAL RED CROSS (First Class)

Acting Matron: R. M. Whyte, A.R.R.C., Princess Mary's R.A.F. Nursing Service.

ROYAL RED CROSS (Second Class)

Act. Senior Sister: D. M. Schilling, Princess Mary's Royal Air Force Nursing Service.

BRITISH EMPIRE MEDAL (Military)

Chief Airman T. J. Beere; Act. Chief Radio Electrician (Air) (W) W. T. Jinks; Chief Petty Officer (Air A.M. (A)) F. E. Johnson; Act. Warrant Aircraft Officer S. Jones; Air Artificer J. F. Yeatman.

Flight Sgt.s: C. G. Argent; A. J. Coutts; J. E. Frost; W. E. Fuggle; A. E. C. Hellyer; J. A. Marsh; G. C. Mullings; W. W. Phillips; J. Rogers; J. L. Stringfellow; T. W. Tyler; A. A. Wiseman. Sgt.s: D. J. Abercromby; W. A. Balchin; H. W. Cawte; R. E. Gibson, R.Aux. A.F.; A. C. Hazlitt; R. McDermott; L. S. Pullen; H. J. G. Tailford; J. Thompson. Cpl.s: W. R. Baker, R.A.F.V.R.; P. W. Batty; R. Horne; J. S. D. Robb. L. A/C.: A. E. Powley.

Sgts.: E. M. Burns, W.A.A.F.; R. M. Lehane, W.A.A.F.; M. Troy, W.A.A.F.; Cpl.: A. M. Fisher, W.A.A.F.

(Civil)

Miss W. Annikin, Manageress, N.A.A.F.I. Maintenance Unit, R.A.F., Stafford; Mr. N. Bailey, Fitter, No. 2 M.U., R.A.F., Broadheath; Mr. E. V. Beechey, Principal Foreman, No. 27 M.U., R.A.F., Shawbury; Mr. L. A. Moncrieff, Experimental Officer, T.R.E., M.o.S., Malvern; Mr. W. Green, Service Engineer, Dunlop Rubber Co.

Physiological Aspects of Flying

Some Effects of High Speed and High Altitude

IN America a great deal of time is being devoted to study of the human element in high-speed and high-altitude flight. Dr. W. R. Lovelace, M.D.,* recently prepared a paper for the S.A.E. National Aeronautic Meeting at Los Angeles, entitled *Physiological Aspects of High Speed and High Altitude Flying*. In this lecture some well-known facts are collected and presented in an orderly manner, together with many new details and figures. In the introduction it is stated that because of the necessity of mass producing all items of personal equipment used by aircrew, it was necessary deliberately to subordinate research and development during the war. Because of the lack of fundamental research applied to human beings engaged in flying, aircraft were designed and produced in such a way as to take little recognition of those who were to operate them. As a result, aircrew members were often required to perform highly skilled jobs under conditions disadvantageous to human activity. It was now realized that emphasis on human requirements in the design of aircraft would decrease proportionately the effort otherwise necessary to meet demands for personal equipment, and at the same time would increase the efficiency of the flyer.

As an example of work done during the last decade, oxygen systems were briefly described. The latest type in the possession of the Army Air Forces being pressure demand equipment which combined flow and pressure indicating instruments and raised the operating ceiling from 37,000 to 42,000ft and even to 50,000ft for emergencies.

During the war short cuts were necessarily introduced into the programme of development of equipment to meet the exigency of the situation. Now supersonic speeds added requirements beyond the existing protection from g effect. Present g suits would protect personnel at 7g for 10 seconds. The suits could be improved—but this was becoming increasingly difficult—or the position of the pilot changed. The exact relationship of human tolerance to short durations of g had not been adequately evaluated. The problems involved in vision at high speed both from the standpoint of cockpit canopies and protective glasses and goggles would involve extensive development. Colour vision had not been fully investigated. Shatterproof sun goggles and lenses to protect the eyes from intense light, as when exposed to an atomic explosion, would need further investigation. The possibility of applying correction factors to lenses to enable experienced pilots with deficient vision to carry out their flying duties in the normal manner was mentioned. Finally, escape from high-speed aircraft not only entailed study of human factors when related to the ejection seat, but also required attention to be given to parachute opening, shock, exposure to high altitude, high wind velocity and extreme cold.

Dr. Lovelace believed that to be successful an Air Force must organize research and development activities in four phases: Basic research, applied research, development and test. He enumerated four principal departments in the U.S. Air Force research and development organization.

Limitation to Human Capabilities

Due to increasing speeds, altitudes and ranges making ever greater demands upon the human beings who fly them, there was a real possibility that aircraft development might some day be halted because of the inability of the human organism to tolerate the strains and stresses to which it would be subjected. Twofold objectives had therefore been set for aviation medical specialists. To gain a thorough understanding of the maximum capabilities of the human system and to guarantee the full utilization of these capabilities without undue risk to health, safety or efficiency.

An Arctic aero medical laboratory had been established in Alaska during the past year to maintain a well-equipped laboratory inside the Arctic Circle to study the problems of acclimatization to cold.

Turning to problems presented by high-speed flight in particular, the author said that during normal flight at great speeds appreciable distances were traversed in a fraction of a second, marked changes in altitude occurred rapidly and deviations from a straight course produced g effects. In addition, the action of the slipstream and the engines might set up noise and vibration of considerable intensity, and heat was generated from various sources. He mentioned that every action of the pilot was separated from the action-eliciting stimulus by an inherent time lag called reaction time. For simple reactions this was approximately 0.2 seconds, or at a nominal ground-level speed of 1,200 m.p.h. a time lag representing 352ft traversed. For what were termed discriminative reactions the time was 0.4 seconds or more, and these times pre-supposed that controls were immediately at hand and in a state of readiness to respond appropriately.

When two present-day jet aircraft approached each other at 550 m.p.h. from a distance of five miles they would meet in only 20 seconds. To keep the reactionless period at a minimum it was necessary that vision be undisturbed and that the pilots selected be able to meet maximum visual standards for such attributes as acuity, depth perception, colour vision, muscle balance and night vision. A plate glass of high optical quality had poor aerodynamic qualities for high-speed aircraft, and the tendency was to use formed plastics for windscreens and domes. The optical quality of these at present was not as good as that of grade B glass, with a resultant loss to aircrews of range of vision, perception of depth and loss in transmission. The German Air Force had sponsored the development of curved bullet-proof plate glass.

Protection Against g

Regarding g effects and the deviations from straight flying course at high speeds, a suit designed for protection against acceleration in the direction foot to head, or positive g, had been developed, and its limitations stated. Much of the research and development of the suit had been of a practical nature, but a great deal of fundamental research remained to be carried out on humans and animals. Complete studies should be made of the effects of positive g of duration of 1, 2, 3, 4 and 5 seconds. This would provide information regarding minimum time for black-out. Very quick turns might be one method of eluding guided missiles.

The flexed spine might be injured by positive accelerations of magnitude readily withstood by the erect spine. Some results taken from Eighth Army Air Force fighter operations statistics were quoted to indicate that the g suit was an important factor in increasing combat efficiency.

Relationship between use of g Suit and Enemy Aircraft shot down

	No of a/c shot down	No of sorties	No of oper. hr.	No a/c shot down per 1,000 sorties	No a/c shot down per 10,000 oper. hr.
Wearing g suit ...	87	3,048	13,059	29	67
Not wearing g suit ...	58	3,911	17,362	16	33

A human centrifuge had been used to estimate the restrictions placed on man's locomotive ability by the application of radial g (centrifugal force). 1. Movement in the same direction as the radial force was easy but hazardous. Falling 1 foot at 2g was sufficient to knock the wind out of the five subjects studied, and it was concluded that falls of greater distances at slightly higher accelerations would cause injury. 2. Movement at right angles to radial g showed that on the average the time required to crawl across the end of the centrifuge, a distance of 7½ft, was increased 2¼ times by 1g radial, 5 times by 2g and 10 times by 3g radial. Three of the five subjects tested could not accomplish the task at 4g.

The time required to round a barrier which projected 22 inches from the back of the centrifuge was increased 2¼ times by 1g radial, 6 times by 2g and 18 times by 3g radial; the subjects stated that they could not accomplish the task at 4g. The results indicated the tremendous increase in time required to perform simple movements of the body under radial g and that at 4g even these simple movements became impossible for most subjects.

Movement against radial g had a distinct bearing on escape. Against a force of 2 to 3g it became impossible for the subject to crawl, walk, climb a rope or ladder, or rise from a bomber seat. Another action tested when exposed to radial g was the donning of a parachute. The average time taken by three subjects was 17 seconds at 1g, 21 seconds at 1g radial 4g

W. R. Lovelace II, M.D., Head of Section on Surgery, Lovelace Clinic; Chief Surgeon, Aviation Medicine and Research, Trans-World Airline System, Chairman of Panel on Aviation Medicine and Psychology, Army Air Force Scientific Advisory Board.

Physiological Aspects of Flying . . . . .

seconds at 2g radial, one minute 15 seconds at 3g radial. One subject was unable to complete the task at 3g.

The acceleration developed in rocket-propelled take-offs of piloted aircraft would be limited by the personnel carried. It would be important to learn what maximum g in the transverse position, relative to the pilot as experienced when seated, could be tolerated while still allowing him to perform accurate movements with hands and feet. If the pilot was in the prone position head forward, linear acceleration at take-off would represent positive g and on landing negative g would be experienced. The tolerance of man to positive g when fully stretched out was known to be very low, and the limiting g for this position should be determined.

Concerning negative g, Dr. Lovelace said that at the Aero Medical Laboratory at Wright Field it had been found that exposure to negative g for several seconds would lead to overdistension and rupture of vessels within the head, but exposure to higher accelerations for times under 0.3 seconds did not cause such injury. Means were necessary to exert counter pressure on the veins in the head and neck. Experiments using monkeys had indicated that confusion and unconsciousness resulting from relatively long exposure to negative accelerations above 3g might be the result of a reduction in cerebral blood flow due to arterial pressure drop.

The eventual aim was to design aircraft and equipment that would function in any part of the world at an operational temperature range of from −60 deg F to +160 deg F. In addition to the effect of solar heat upon the man without cabin cooling, the temperature in the cockpit of some aircraft could easily reach 180 deg F at extremely high speeds. It had been necessary to develop experimental flying clothing that could be ventilated internally. Results had indicated that it might soon be possible to protect pilots over the temperature range quoted by the use of a single lightweight clothing assembly.

Regarding noise and vibration, the author said that Army and Navy pilots had uniformly expressed their great appreciation of lack of noise and vibration during flights in jet aircraft, stating that there was less fatigue present.

Pressurization and Decompression

Cabin pressurization was next discussed, and a definition of comfort was given as "the state in which one is unconscious of adaptation to environment." Passengers did not have a sense of comfort or complete freedom of sensation above 5,000ft until they were acclimatized. Normal healthy people could accommodate to altitudes as high as 12,000ft.

Loss of presssure in present-day pressurized aircraft could be considered a minor hazard in view of existing laboratory and flight test information. The degree of compression that one could stand safely was determined by the extent and the rate of expansion of the internal body gases. It had been demonstrated that for rapid or instantaneous decompressions (0.01 seconds or less) a relative gas expansion of 2,3 approached the maximum tolerable.

The area of fuselage surface lost by structural failure had in the long run to be evaluated by tests. For preliminary design purposes it could be assumed to be in the area of a jettisonable bubble canopy, a nose section or an escape hatch door. For a commercial aircraft (2,000 cu ft capacity and up) flying with a cabin differential of 6.55 lb/sq in at 40,000ft, the largest allowable explosive orifice was 7,000 sq in, or a hole 8ft in diameter. Such a hole was ten times larger than that normally expected, thus decompression could be considered a minor hazard for the type of aircraft.

Decompression experiments on human subjects had indicated that the normal ear could easily adjust itself to a rate of pressure loss of 100 lb/sq in per second. This was not true when suffering from colds or respiratory infections, and a passenger with an occluded sinus would suffer severely from pain when either the volume or the pressure of the trapped gases increased as little as 30 per cent regardless of the rate of decompression.

Lessons that could be applied to passenger aircraft were obvious. Restricted passageways between compartments should be avoided. This precaution was especially important as the height of aircraft increased, and regular exits should have safety harness or nets across the inside during flight to prevent passengers and crews from being accidentally blown overboard.

The Army Air Force had recently announced the development of a pressurized flying suit that would enable aircrews to fly at altitudes above 60,000ft and low pressures approaching a vacuum and to escape from aircraft if the necessity arose. Yet the suit was sufficiently flexible for them to carry out their duties in comfort.

Personal equipment for air crews must not only provide the maximum comfort and efficiency in flight but also be designed to be of use in the event of emergency, bale-out or forced landing. The U.S. Air Forces' training programme would soon include for fighter pilots instruction in the use of the ejector seat. Some 300 ejections with dummies and volunteers had been made without serious injury to test personnel and a system for emergency escape from aircraft at speeds up to 600 m.p.h. had been developed. With present catapult and ejection seats subjects could be ejected with a velocity of 60-64 ft/sec with maximum acceleration of 15g —5 to 10g less than that considered the safe skeletal tolerance.

The Germans had found that a pilot ejected from a cockpit could withstand ram pressures on the unprotected head up to 480 m.p.h. for a few seconds without tearing tissues. With proper positioning of headrests on ejector seats it was found that the head could be kept erect during the ejection stroke, thereby preventing hyper extension.

Modifications to the ribbon type parachute used in Germany and now undergoing constant test in America would undoubtedly provide for safer escape from high-speed aircraft at both low and high altitudes.

Baling Out at Transonic Speeds

Safety provisions for the pilot of the Douglas D.558 Skystreak in case of extreme urgency at transonic speeds entered discussions in 1945. The device finally chosen consisted of a mechanical fastening of pilot's compartment to remainder of fuselage by means of four bomb-rack-type hooks, operated mechanically by a pull handle located above centre of the instrument panel. A 60-lb pull on the handle completed successively, a two-second decompression of the pressurized cockpit and release of bomb-rack hooks. The pilot baled out by pulling a cable handle at right hip location. A 10-lb pull on the handle simultaneously released the pilot's backrest and shoulder harness fastening, allowing him to move or fall out of the rear of the cockpit. Should the speed of the aircraft be below that indicating a nose-breakaway escape, the pilot could jettison the bubble canopy section by a 20-30 lb pull on a cable located near the right knee level.

Human engineering is now being applied to the field of linear decelerative forces of rapid onset, brief duration, and high magnitude and their effect on the human body. The Aero Medical Laboratory of the Air Materiel Command has in process of development a linear decelerator, located at Muroc Experimental Air Base, with which it will be possible to apply linear decelerative forces within the range of 5 to 100g peak magnitude, 0.01 to 0.5 sec duration, and 100 g/sec to 10,000 g/sec rate of application. This linear aircrew decelerator can achieve speeds of 220 m.p.h. with a maximum of 3.2g acceleration, and, by means of exceptionally powerful friction brakes in series, can be brought to a stop in as little as 11ft. Thus, it will be possible to take actual crash data, ditching data, or parachute-opening shock data, and reproduce these forces at will under controlled conditions for analysis and study.

The toxic effects of carbon dioxide at both ground level and altitude deserved more study. Although direct evidence in the literature was meagre, a recent review of the problem (White, 1948) tentatively fixed the maximum safe allowable carbon dioxide concentration at ground level at 5 volumes per cent for 5 minutes or less, 4 volumes per cent for 15 minutes or less, and 1 volume per cent for not more than two hours. Carbon dioxide was better tolerated at altitude, and tolerance, being a function of the partial pressure, allowed calculation of altitude equivalents from ground level data. Four volumes per cent carbon dioxide at ground level, for example, was equivalent to 5, 6, and 7.5 volumes per cent at pressure altitudes of 5,000, 10,000 and 15,000 feet respectively. Most modern airliners carried considerable amounts of carbon dioxide for fire-fighting purposes and some had been tested in flight against hazardous carbon dioxide concentration. It was doubtful whether the problem had had widespread appreciation, since no relevant civil regulations existed.

ALVIS PROGRESS REVIEW

THE recent annual general meeting of Alvis, Ltd., was presided over by Mr. J. J. Parkes, the managing director, in the absence through illness of the Chairman, Mr. A. E. Nicholson, J.P. In the Chairman's statement, reference was made to the growing utilization of the Alvis Leonides engine. After speaking of the breaking of the international speed record for helicopters by the Fairey Gyrodyne, which was powered by a Leonides engine, it was stated that production orders had been received from both Bristols and Westlands for Leonides engines for use in helicopters.

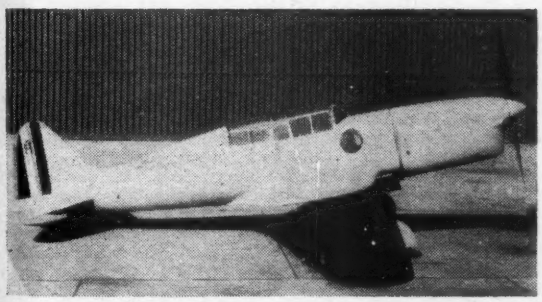
News from Italy

S.A.I.-Ambrosini Activities : Italian Four-Year Programme

THE recent visit to this country of Mr. R. U. Valeri, of S.A.I.-Ambrosini and Co., of Milan, provided us with the opportunity of learning something of that company's present activities and its future part in the Italian aircraft industry's Four-Year Programme, which was inaugurated in November and is designed to co-ordinate aircraft production and regain something of Italy's pre-war position in European aviation.

The Societa Aeronautica Italiana was incorporated into the Ambrosini group in 1934 and, since that time, has produced a series of touring and training aircraft. The company's Passignano factory was severely damaged by Allied bombing but has since been rebuilt and is now producing considerable numbers of the S.1001 Grifo monoplane which, it may be remembered, set a new international non-stop long-distance record for touring aircraft in this category in April last by flying from Udine to Massaua. At the time of writing, a new long-distance flight is planned for the Grifo from Milan to Buenos Aires. The flight, which was due to have commenced on December 20th, will be made via Madrid—where the Grifo will remain for some days to be demonstrated to the Ejercito del Aire—Casablanca, Dakar, Port Natal and Rio de Janeiro.

The Grifo is becoming increasingly popular and considerable orders are now on hand. In addition to the four-seat tourer and taxi versions, the Grifo is in production as a two-seat military trainer. The company have orders for this variant from the Italian Air Force and an initial batch of the military trainer, consisting of 12-15 aircraft, is to be delivered to Argentina in the near future. One machine is also on order for Spain, but is at present awaiting the arrival of an engine fitted with a de Havilland v.p. airscrew. It is of interest to note that the Israeli Military Flying School, *Alica*, at Rome, which is staffed primarily by American instructors, is using four Grifo trainers and has a number of additional machines on order. This version of the Grifo differs in a number of respects from the tourer; a 145 h.p. Gipsy Major 10 replaces the Alfa-built 130 h.p. Gipsy Major 1, the wing has been moved forward some four inches and the aircraft seats instructor and pupil side by side with dual wheel controls.



S.A.I.-7, an international class speed record holder.

Under the previously mentioned programme, S.A.I.-Ambrosini and Aeronautica d'Italia (Fiat) will be the major producers of training aircraft in Italy. Ambrosini will build quantities of both the S.A.I.-7 advanced trainer and the Grifo, and Fiat will build the G.46 and the G.59. The latter is the new designation for the G.55AM and BM trainer variants of the G.55 single-seat fighter. The G.46 is being exported to Argentina and both the G.55 and the G.59 are being delivered to the Egyptian Air Force.

The S.A.I.-7 is not a true post-war aircraft, having been designed in 1939. Although considered successful, production plans for this aircraft were shelved during the war years owing to more pressing commitments. The S.A.I.-7 is still the holder of the International Speed Record over a 100-km closed circuit for aircraft in this category. The prototype illustrated was originally powered by a 280 h.p. Isotta-Fraschini Beta R.C.10, but this engine has now been replaced by a 225 h.p. Alfa 115 ter. It is hoped to power production machines with the Gipsy Queen 70. At present, an initial production order for twenty machines of this type for the Italian Air Force is in hand and, under the Four-Year Programme, the company expect to produce some 400 S.A.I.7s, both for home and export.

Ambrosini S.1001 Grifo with Gipsy Major engine.

The following performance figures refer to the Beta-powered prototype: Maximum speed, 252 m.p.h. at 5,740ft; stalling speed, 65 m.p.h.; climb to 3,280 feet in 1 min 30 sec, to 6,560 feet in 3 min 30 sec, to 16,400 feet in 14 mins. Service ceiling, 23,000 feet; normal range, 560 miles. The S.A.I.-7 is a very clean design of all-wood construction and it is estimated that, with the Gipsy Queen 70 engine, the maximum speed will be increased to nearly 310 m.p.h.

The prototype S.A.I.-Ambrosini P.512 twin-engined light freighter, described in a recent issue of *Flight*, has now reached an advanced stage in construction and should be ready for flight testing in March. A passenger/freighter version is being prepared with accommodation for 10-12 passengers. To conform to I.A.T.A. requirements, the two 225 h.p. Alfa 115 ter engines will be replaced by two higher-powered units, possibly Gipsy Queen 30s.

Of late, there has been comment in the Press regarding the advisability of permitting Italy to produce British jet aircraft and engines. Under the Four-Year Programme, it is planned that Aeronautica Macchi, S.A.I.-Ambrosini and Aeronautica d'Italia (Fiat) shall all undertake the construction of jet fighters, and Fiat (and possibly Piaggio) will also build jet engines. Discussions have taken place during the last few weeks between representatives of the Italian aircraft industry, the Air Ministry and the de Havilland Aircraft and Engine companies regarding the production of the Vampire by the Italian concerns. At the time of writing the necessary licence has not yet been granted.

This subject of permitting Italy to produce British jet aircraft and jet engines has received much adverse comment in certain quarters. One newspaper columnist inferred that, owing to "Communist domination" in the Italian aircraft industry, allowing Italy to manufacture the Rolls-Royce Nene would be a roundabout way of sending copies of the blueprints of this engine to Russia. Furthermore, he states that by so doing we would be repeating the error made in selling examples of this engine to the Russians. To the writer, it would appear that this columnist is forgetting that few objections were raised to the granting of a licence for the production of the Nene in France, a country possessing a higher percentage of Communists in its aircraft industry than does Italy.

S.A.I.-Ambrosini, which hitherto has only produced aircraft, has, since the war, designed and built prototypes of two light aircraft engines. W. G.

Aviation Analysis

A Personal Expression of Opinion on the Effect of Nationalization of Civil Aviation in Great Britain and a Brief Review of those Events which led to Government Control of the Airlines

TO the members of the Metropolitan Section of the Institute of Transport on January 3rd Mr. John Brancker gave his views on the nationalization of air transport in this country. They were, he stated, purely personal, and in no way the considered opinion of B.O.A.C. or any other body. After a general analysis he left his audience to decide whether nationalization had been beneficial or otherwise, emphasizing that there must be some standpoint for such judgment, which could only be the main national interest, not forgetting the interests of the Commonwealth and ultimately the world. He sounded a word of warning to avoid attributing to nationalization results which were due to entirely different causes, but which happened to have come almost simultaneously. He referred briefly to conditions after the 1914-18 war, when European countries bolstered their own airlines, and this country was forced into granting a subsidy of some kind. Since the Government could not subsidize British companies to compete with each other, the British operators were amalgamated and formed into one company, Imperial Airways.

Mr. J. W. S. Brancker who is General Manager, Eastern Division, B.O.A.C.

At that time, although there were certain obligations as to the aircraft used, and of Government-nominated directors on the Board, there was no question of the Air Ministry having anything to do with the management, nor of the company having anything approaching monopoly rights. Air transport had, he said, always had rather a special relation with Governments since at the outset it had been unable, except in very peculiar circumstances, to stand on its own feet, and had it not been a very special enterprise it might easily have been left to expire. The whole conception of aviation was inextricably bound up with the idea of war and defence, but had it been able to show profits immediately, it might have been strong enough to retain its strategic importance without losing its independence. Owing to its very nature and its own shortcomings, however, it was bound to receive its fair share of Government interest, although not always its fair share of support.

Mr. Brancker then referred briefly to the period between the wars, when the Licensing Board was set up, the Cadman Enquiry was held, and when there was considerable friction between Imperial Airways and the Department of Civil Aviation, then part of the Air Ministry. It was difficult to reconcile the views of the Government department and those of a world-wide operator with a private-enterprise outlook.

Cadman Committee

The lecturer again referred to the Cadman Committee and its recommendations for splitting the routes between Imperial Airways and British Airways, Ltd., which proved so cumbersome, and which were quickly abandoned in favour of another type of organization. The Committee recommended greater financial support for British air transport, but in its failure to satisfy the principal requirements of the industry, the door was left open to early revision. After Lord Reith, then Sir John Reith, became chairman of Imperial Airways, that company and British Airways, Ltd., were amalgamated by Government Act, and B.O.A.C. was set up as a statutory Corporation. This was the first step in the direction of national ownership. A clause in the Act gave the Secretary of State for Air special powers with regard to the Corporation in a state of emergency, and since war had already started, B.O.A.C. did not actually function according to the intentions of its peacetime charter. The result was that the Government became the owner of an operating concern without giving itself many safeguards; in fact, domestic airlines and charter operators were not restricted.

In America, instead of abandoning all civil aircraft design as had been virtually done in this country during the war, the United States continued to pursue energetically the construction and development of transport aircraft. Moreover, instead of reducing transport services to a minimum, they were expanded, and besides encouraging the growth of national operators they were employed to form the nucleus of a Transport Command for which generous allocations of staff and equipment were made by the American authorities.

Mr. Brancker emphasized this point to compare the position in which Britain found herself at the end of the war, with no genuine transport aircraft and only a small number of individuals with civil aviation experience. Then followed a long period of indecision as to the ultimate shape which civil air transport should take. Many months passed while discussions took place, on the principle that B.O.A.C. should remain as a wholly owned Government Corporation while B.E.A. and B.S.A.A. would be set up as organizations jointly owned by the Government and private enterprise. When the present Government assumed power, however, those schemes were abandoned, and after further deliberation and delay, the existing system of three nationally owned Corporations was laid down by Act of Parliament.

In Mr. Brancker's opinion, it was those delays which set us back so much in the early days, and if private enterprise could have been given the "all clear" from the start, it might have made a very much more rapid get-away. He did not, however, underestimate the difficulties and changed conditions which would have affected private enterprise as much as the national Corporations.

In examining some of the problems, Mr. Brancker suggested that although the main users were faced with shortage of suitable aircraft, had they been independent of Government ownership they would have found it easier to be critical of Government policy in the matter of aircraft types. It was, however, a moot point whether they would have been more successful because even a more accurate description of what was required would not necessarily have produced it. There was always, he said, a tendency for a Government-owned organization, when it found itself in disagreement with its controlling Ministry, to make its protests and to accept the decision which might well be good for national policy but would not essentially produce efficient air services. There was no doubt, he said, that the decision to use British types which were not designed *ab initio* as transport aircraft had been responsible for the greater part of the Corporation's losses.

Competition Not Eliminated

There was, Mr. Brancker thought, considerable distrust of the word "monopoly," and it was the fact that the Corporations had certain rights which made many people critical of nationalization. He made the observation, however, that there was considerable competition from foreign operators over the vast majority of sectors flown, which were limited only by inter-Government agreements and I.A.T.A. regulations, and some form of licensing and rationalization had always been found desirable. Nationalization, therefore, could not be charged with the elimination of competition. Although not suggesting that it was necessary for our own airlines to be nationalized, there was no doubt that it had made it easier to arrange close partnerships with Australia and South Africa.

In answer to criticisms that nationalization had encouraged the Corporation to organize itself on a lavish base, Mr. Brancker thought that had B.O.A.C. operated for a time in normal peace conditions such a tendency for undue expansion would have rectified itself automatically. As it was, there had been a tendency for the organization to get closer and closer to Civil Service lines and there had been a definite tendency on the staffs to accept Civil Service outlook, and individuals had been unwilling to risk taking decisions.

Referring to the set-up of the Ministry of Civil Aviation, the lecturer suggested that the number of Committees which had been formed to enquire into almost every aspect of the business was due to the rapid expansion after a period of almost complete hibernation.

He did not think that any lack of initiative had

been caused by nationalization, nor that there was any particular shortage of that commodity in the Corporations which could not be attributed to the difficult state of affairs. It had, he thought, probably provided a very favourable degree of stability which would enable genuine progress to be made in the future. That could perhaps, he thought, have been achieved by making long-term agreements with private operators, but because of the large sums of money involved, and the uncertainty of the future, such agreements would have been difficult.

Nationalization had provided adequate Government support to develop a full system of routes on a permanent basis, and it was unfortunate that so much expenditure had been absorbed in overcoming inadequate equipment instead of being devoted to building up trade in the future. Mr. Brancker thought that because of Government ownership the Corporations had been subject to rather more criticism than would have been the case in normal circumstances.

One effect which he thought should be recorded was that, if main air transport services were operated privately, frequencies and schedules would be arranged to give the best commercial results. In view, however, of the special status of the Corporations, there was a tendency on the part of other Government organizations to require their own interests to be given special consideration. It was quite erroneous to think that the nationalized corporations had not a commercial outlook. It was not, of course, permissible to adopt other than straightforward tactics, and they were, also, not as free as the private commercial operator to cut rates or adopt similar devices. If, however, stability was required, that situation was, perhaps, not particularly disadvantageous. He emphasized that the operators should be free to handle such matters themselves.

Mr. Brancker suggested that the key to the situation was, perhaps, less the actual ownership of the operating organizations than the way in which they were controlled, and if they could be permitted to function flexibly and independently, as ordinary operators, there was little doubt that they would be successful, since many of the ills attributed to nationalization were, in fact, due to other causes.

MODERN ELECTRICAL SYSTEMS

Use of High-Voltage Supplies on Large Civil Types : A New Battery Design

WITH the increasing tendency towards large size in civil aircraft, and the correspondingly heavy demands on their electrical equipment, considerable attention is now being given to the advantages offered by high-voltage electrical systems. (The term "high-voltage" is used here in a general sense, though it now has a specific meaning, as will be explained.)

It is well known, even among those not closely concerned with electrical engineering, that use of a high voltage can effect a considerable weight-saving in cables, because (to put it briefly, if rather loosely) high voltage is able to overcome the resistance offered by a small core; and the weight saved by use of a small core is by no means counterbalanced by the increased weight of any extra insulation which may be necessary. Other important advantages, however, are conferred by the use of a high-voltage A.C. supply (rectified for D.C. applications) as compared with the conventional 24-volt D.C. Chief among them, perhaps, is the fact that the use of an alternator and rectifier makes full power available over a wide range of engine speed, an important consideration in passenger aircraft with their heavy, and often simultaneous, current demands for such services as cooking, non-hydraulic actuation and radio. The use of alternating current also makes it a simple matter to transform the supply to higher or lower voltages for specific purposes, using in many cases, transformers with no rotating parts.

It is, perhaps, indicative of the widespread adoption of these systems that voltages up to 250 are already officially known as "low voltage," while the old 24 has become "extra-low voltage." The term "high-voltage" is now reserved for systems above 250 volts.

A.C. systems in the up-to-250v category, now under development, include a 400-cycle 3-phase 208V supply. This, while effecting even greater economies in cable-weight, will also show a further saving in the weight of motors, which are becoming steadily more numerous in aircraft of large size. Use of the squirrel-cage type of A.C. motor in turn confers an additional advantage, for in this motor there is no commutator or brushes, and thus maintenance is simplified, radio interference is reduced, and the present problems of excessive brush-wear at high altitudes are eliminated.

Adoption of a 400-cycle high-voltage supply, of course, postulates the availability of accessory equipment designed to work on it, and already a number of such components are under development.

Two of the first British civil aircraft to incorporate medium-high-voltage systems are the Handley Page Hermes IV and Bristol Brabazon. Also, although no details have yet been made available, it is a safe guess that a similar system will be used in the Saunders-Roe SR45.

In the case of the Hermes power is supplied by two three-phase Rotax alternators, one on each of the inboard Bristol Hercules 763 engines. The 120V output is rectified by metal rectifiers of the selenium type, while a separate 115V A.C. system for operating the radar and gyro services is provided by two motor-generator sets operating from the D.C. 120V supply.

The generating system "balances" battery discharge by providing an additional charging supply at 28.5V for the 24V batteries catering for the extra-low-voltage services. The 108V Exide battery consists of four 24V type 12ZCS11 units and one 12V type unit of similar type, having a capacity of 15Ah for a total weight of 150 lb. The use of four 24V and one 12V unit, connected in series, gives a total of 54 2-volt cells, which is all that is required within the nominal 120V system. One 24V unit is tapped to give a supply at that nominal voltage for radio and instrument services. Physically, this arrangement of 24 and 12V units gives a "flexible" battery installation having overall dimensions of only 35in x 15in x 6⅝in high.

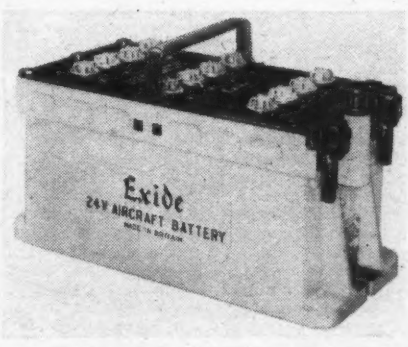
A somewhat similar installation will be used in the Hermes V (four Bristol Theseus airscrew-turbines), but 108V Exide 12-ZC11 batteries of rather larger capacity, giving 25Ah for a total weight of 200 lb, are being employed..

On the Bristol Brabazon, a 208V 3-phase 400-cycle system is being utilized, the current being generated by six 30kVA alternators, giving a total D.C. capacity of 36kW obtained from six 6kW rectifiers.

Only a small percentage of the total electrical installation calls for extra-low-voltage D.C. operation, for which purpose nominal 24-volt batteries will be used. In order to provide a sufficient battery output and storage reserve, accumulators having a total ampere-hour capacity of 240 a.h. at 24V were decided on, provided by two separate banks each consisting of four 12V 60 a.h. Exide units type 6FZ17-3 coupled in series/parallel, the necessary charging current being drawn from the main 208-volt A.C. supply converted through selenium rectifiers and voltage-controlled at approximately 28V.

The 24V "ZCS" type of Exide battery as fitted to the Hermes is an entirely new design of somewhat striking external appearance, for the familiar black ebonite case has given place to a cream-coloured polythene moulding. This material, in spite of its comparative lightness, is stated to have a high degree of toughness and shock-resistance, to be unaffected by oil or petrol and, of course, sulphuric acid, and to have exceptionally low susceptibility towards softness or brittleness at very high and very low operating temperatures respectively.

Each cell is fitted with "microporous" P.V.C. separators, and it is claimed that the battery can be stored indefinitely in a new and unfilled state without ill-effects. Fittings include a hinged lifting handle and a foolproof topping-up device which automatically limits the electrolyte level, while the terminal connections, which are completely polarized, are of a new quick-release type.



The 24-volt Exide battery, type ZCS.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

METEOR CLIMBS

Relative Performances with Derwent and Beryl

MAY I correct a statement made in *Flight* of December 23? The error occurs in an article giving comparative climb performances of the Meteor Mark 4 fitted with Rolls-Royce Derwent V engines, and Meteor Mark 4 fitted with Metro-Vick Beryl engines.

You state that the Derwent Meteor requires 8 min and 17 min to climb to 30,000 and 40,000 feet respectively.

At combat r.p.m., and with no external fuel tanks, the figures for the Derwent Meteor are:—

Time	to	*Height*
6.5 min		30,000ft
11.8 min		40,000ft

Hucclecote, Glos. E. S. GREENWOOD,
Technical Sales Manager.

HELICOPTER HALOES

Robert Carling Taken to Task

WITHOUT being goaded into anything, Casual Commentary (*Flight*, December 30th, 1948) does require an answer, but unfortunately to do justice would take too much of your valuable space.

The article is a mixture of truth, half-truth and sheer bunkum, and it would be very interesting to meet Mr. Carling's so-called experts. In 26 years of flying, over 16 of which have been mainly on rotary-wing aircraft, I have never seen any haloes floating around, but almost certainly have heard various people "shooting their necks out" with insufficient knowledge of their subject.

Finally, may I invite Mr. Carling to attend the next Helicopter Association lecture on January 22nd at 2.30 p.m. at the Royal Aeronautical Society, when he will have the opportunity of meeting and talking to some who, like myself, are rotary-wing enthusiasts but by no means experts.

Southampton. H. A. MARSH.

ALTIMETER SETTINGS

"Let the R.A.F. Play with Queenie Nan How"

I HAVE read the paper on Altimeter Settings by W/C. Shelfoon in *Flight* of December 16th with interest and, may I add, with great disapproval. It is supposed to expound the argument in favour of the QNH Setting and yet, in my opinion, fails to produce a single factor in its favour and a considerable number against!

It further introduces statements which are, to my mind, fallacious. An example of this is the statement that numbers of accidents due to collision with high ground have been caused by the use of a QFE Setting. What proof has W/C. Shelfoon of this? And why, if this is correct, were the pilots concerned flying on a QFE Setting and not on a Regional QFE, as they are supposed to do? Apparently we are lucky not to have had some mid-air collisions due to some pilots flying Quadrantal Heights on a QFE and others on a Regional QFF.

W/C. Shelfoon states that a further reason in favour is to expedite air traffic on cross-country flying and in the vicinity of an airfield and further to obviate last-minute alterations to Altimeter Settings before landing, and in the event of an overshoot and subsequent diversion. I do not consider that this argument will hold water, as all airline aircraft are at present using the Regional QFF and, therefore, have a common setting. Even if they used the QNH Setting this would have to be altered before landing at, say, London after a flight from Paris, as only in extremely abnormal circumstances of pressure distribution would the QNH Setting be identical in both places. Therefore, in this respect, a QNH Setting has no advantage whatever over the present system.

The writer goes on to say that reference to maps and approach diagrams is necessary before attempting a blind let-down using a QFE Setting. I venture to state that very considerably more reference to maps, etc., will have to be made before starting a blind let-down using the QNH Setting, as the captain, instead of remembering standard heights at Inner and Outer Markers (which are common to most S.B.A. systems) will have to check the airport height above Mean Sea Level and then add this to the approach heights, giving more scope for mistakes, in that heights at Markers will be different at every airfield he goes to.

Further, W/C. Shelfoon states that in the event of a circuit having to be carried out under conditions of poor visibility, the QNH Setting is preferable to that of the QFE in respect of avoiding obstacles in the vicinity. I would suggest that this statement is at variance with the facts, and that only in the event of an airfield being below Mean Sea Level would the QNH be preferable.

After all, if the airfield is, say, 200ft above Mean Sea Level and you have a hill 500ft above Mean Sea Level in the vicinity, if your altimeter is set to QFE and you carry out a circuit at an indicated height of 500ft, you will clear the hill by 200ft. If you did the same thing with a QNH Setting, you would hit the hill. I am not, of course, suggesting that any normal pilot would indulge in such close clearances. In any case, so far as airline pilots are concerned, they do not operate to airfields in IFR conditions, unless they have been there before and practised the approved let-downs, and are familiar with any obstructions in the vicinity.

As regards the "BABS" Approach system, I am not competent to pass any opinion, as I have never used it, but I note that even here complications arise and the navigator is called upon to carry out the necessary calculations.

In conclusion, it would appear that the QNH Setting has been introduced for the benefit (sic) of the R.A.F. by the Air Ministry, and that M.C.A. have blindly followed suit, on the principle that what is good for the R.A.F. is good for Civil Aviation, which doctrine has been proved in many cases to be false. Leave us, therefore, our "Queenie Fox Easy" and let the R.A.F. play with their "Queenie Nan How" (And How!)

"5055."

Liverpool.

HOW BIG IS TOO BIG?

A Reply to Hilery Stanhope

THE Woolworth Building, a profitable building, is less than two-thirds the height of the Empire State Building, Radio City is just over two-thirds the height of the Empire State.

Hence, the Empire State Building is about 50 per cent higher than the Woolworth and R.C.A. Buildings.

The largest ship just designed and ready for bids in U.S.A. is 48,000 tons. The Queens are 70 per cent larger than this.

The Gold Standard and the law of "supply and demand" both have been discredited time and again in the last 7,000 years of our history, only the law of "diminishing returns" has stood the test of time.

The big planes do not pay, but the smaller passenger planes do pay.

STANLEY M. UDALE.

Detroit, Mich., U.S.A.

WINDMILLS OR JETS?

Thrust the Important Factor

THE interesting article by "Favonius," which appeared under the above title in *Flight* for December 30th, 1948, has inspired the following comments. An apology for their obvious nature would be called for but for the fact that they are usually neglected in popular discussions on this theme; this seems especially true of certain statements which emanate periodically from airscrew specialists in the United States, who seem particularly anxious to make their excellent products do a job for which they are not best fitted.

The criterion of propulsive efficiency—or even overall (thermal × propulsive) efficiency—is a very important factor in determining power plant choice, but it is not the only one. A better guide is the quantity:

(Power Plant Weight) + (Fuel Weight) for a given range at given speed and altitude.

Obviously, the efficiency can affect only the term in the second bracket, and neglect of the first one obscures the very simple reason why jet propulsion is often the best choice, even for design conditions where it is less *efficient* than airscrew propulsion. Also relevant to these considerations is a funda-

Correspondence . . . . .

mental characteristic of the airscrew: even if its propulsive efficiency can be maintained constant at high flight speeds, its *thrust is inversely proportional to speed* for a given engine power (and hence weight). With a turbojet, on the other hand, *thrust is constant* with speed, to a first approximation.

A few rough figures on a particular case may serve to illustrate the operation of these factors: suppose we have a 50,000 lb aircraft flying at a Lift-Drag ratio of 10 at its top speed of 550 m.p.h. at 35,000ft. The thrust required at this altitude is then 5,000 lb, and a turbojet installation to give this would have a sea-level thrust approaching 15,000 lb and a weight of about 6,000 lb.

Now consider an alternative piston engine/airscrew installation, assuming an airscrew propulsive efficiency of 80 per cent, which, as "Favonius" says, "probably leans a bit on the optimistic side." Assuming also the same L/D of 10 (which again neglects the greater cleanness of the jet), we still need 5,000 lb of thrust, and hence a b.h.p. of over 9,000 at 35,000ft.

With a heavily supercharged engine, this would probably imply over 12,000 max. b.h.p. at sea-level, and a total power plant weight (including airscrews, cooling system, etc.) of nearly 25,000 lb that is, about half the assumed all-up weight of the aircraft. If the airscrews were turbine driven, instead of by piston engines, this figure might be reduced to less than 20,000 lb, but still not to less than about three times the competitive turbojet weight.

In practice, many other factors (such as undercarriage weight) serve to increase the handicap of the airscrew types of power plant still further, and in general it can be said that maintaining airscrew efficiencies at 80 per cent, or even more, still does not put this form of propulsion back into the picture for flight speeds above 500 m.p.h.

If speeds much greater than 550 m.p.h. are considered, the results become even more decisive. If the power plants discussed above were to be used at 600 m.p.h. then the 25,000 lb weight piston/airscrew installation would still give its 9,000 b.h.p. at 35,000ft, but (even if its airscrew efficiency remained at 80 per cent), its thrust would now have fallen in the ratio 550 : 600. Its weight per unit thrust would then be even less favourable compared with the turbojet, which would still be giving its thrust of 5,000 lb (or actually rather more). Soon a point is reached where the airscrew power plant weight to give a required thrust approaches the entire all-up weight of the aircraft which it is hoped to propel, and the question of relative efficiencies then becomes merely academic.

In conclusion, it may be remarked that the above considerations leave unaffected the claim of the airscrew to undisputed supremacy at top speeds up to about 450 m.p.h. Since it seems likely that, for a long time to come, many aircraft will continue to operate in this region, it would seem desirable for the airscrew industry to concentrate their energies on this field rather than dissipate effort on achieving extremely high propulsive efficiencies at speeds where, even if realized, they would be useless.

A. V. CLEAVER.
Stag Lane, Edgware Special Projects Engineer.

FLYING BOATS FOR A MARITIME NATION

The Landplane's "Hidden Subsidy"

THAT many air travellers prefer flying boats to landplanes is proved by the fact that on two occasions recently when B.O.A.C. flying boats to take passengers to South Africa had become unserviceable and there was likely to be a delay of a week, all the passengers refused the offer of an immediate alternative trip by landplane and preferred to wait for the boat. The spaciousness and the safety, added to the greater romance of air-water travel, has a big appeal.

America has taken the lead with civil landplanes, but Britain now has every chance of overtaking the United States, with the 140-ton flying boats now being built, which will surely take the place in the affections of air travellers of all nations which the "Queens" hold for sea voyagers.

The landplane has regained ascendancy since the war, but only because of what amounts to a "hidden subsidy" provided by runways built for military purposes during the war. But these runways will not serve the much larger landplanes now building. The cost of flying-boat bases will be much less than runways for the latest landplanes. So the full attention of the British Corporations should be directed to the operation of these flying boats

We have recently seen the runways of Gatow working under the intensive conditions of the Berlin Airlift, breaking up when used by such large landplanes as the American Globemaster, carrying 20 tons. But if we had a fleet of Shetland boats which could bring in the same load as the Globemaster, many of the problems of Gatow runways would be solved, as the Havel lake could take the biggest boats.

London, W.1. SIMON WARRENDER.

FORTHCOMING EVENTS

Jan. 13th.—Royal Aeronautical Society: "The Auto Pilot," F. W. Meredith, B.A., F.R.Ae.S.
Jan. 14th.—The Institute of Transport (Northern): "Commercial Aviation," F. N. Hillier.
Jan. 15th.—British Interplanetary Society: "The Problem of Interplanetary Flight" (Part 2).—"The application of Nuclear Energy," L. R. Shepherd. A summary and Discussion of Parts 1 and 2 will follow.
Jan. 18th.—Londonderry House: Films, "With B.O.A.C. Short Solent flying boat Inaugural Flight to Johannesburg" and "With the Royal Australian Air Force in the Balik Papan Campaign, Dutch Borneo, July, 1945," W. Courtenay, M.M.
Jan. 19th.—R.Ae.S. (Brough): Lecturettes by branch members.
Jan. 19th.—Royal United Service Institution: Films, "Operation Crossroads" and "Operation Plainfare," W. Courtenay, M.M.
Jan. 22nd.—Helicopter Association of Gt. Britain: "Helicopter Operations—Some Problems and Prospects," N. E. Rowe, C.B.E.
Jan. 22nd.—Air Scout Movement: Exhibition at Holloway Baptist Church.
Jan. 26th.—R.Ae.S. (Preston): "Instrumentation in Flight Testing," Miss B. M. Rimmer, A.F.R.Ae.S.
Jan. 28th.—R.Ae.S. (Weybridge): Annual Dance.
Jan. 28th.—London Aeorplane Club: Banquet and Ball.
Jan. 29th.—Society of Licensed Aircraft Engineers South Eastern Area Lecture. "Rolls-Royce Power Units," W. P. Calvert, A.F.R.Ae.S. Mansion House 26, Portland Place, London, W.1, at 3 p.m.
Feb. 1st.—R.Ae.S. (Belfast): "The Propeller Turbine Engine," F. M. Owner, M.Sc., F.R.Ae.S., M.S.A.E.
Feb. 2nd.—Royal United Service Institution: "Meteorology in War," Sir Nelson King-Johnson.
Feb. 5th.—Air Scout Movement: Exhibition at Holloway Baptist Church.
Feb. 9th.—Royal United Service Institution: "Land/Air Warfare," Air Vice-Marshal W. L. Dawson, C.B., C.B.E.
Feb. 9th.—R.Ae.S. (Weybridge): "Civil Air Transport," P. G. Masefield, M.A., F.R.Ae.S.
Feb. 11th.—Guild of Air Pilots and Navigators, and Air League of the British Empire: Ball in aid of the Guild's Benevolent Fund and the Air League's Young Pilots' Fund.
Feb. 12th.—Rugby Football Twickenham, Royal Navy *versus* Royal Air Force.
Feb. 12th.—British Interplanetary Society: "The Design of Liquid-Propellant Rocket Motors," J. Humphries, B.Sc., G.I. Mech.E.
Feb. 15th.—Londonderry House: Films: "Pacific Air Route," W. Courtenay, M.M.
Feb. 16th.—R.Ae.S. (Brough): "Jet Engines," Mr. Winter.
Feb. 16th.—R.Ae.S. (Preston): "The Propeller-Turbine Aero-Engine," F. H. Owner, M.Sc., F.R.Ae.S., M.S.A.E.
Feb. 18th.—Institute of Navigation: "Operational Aspects of Marine Radar." A Symposium of Papers. Chairman: Sir Robert Watson-Watt, C.B., F.R.S.
Feb. 22nd.—R.Ae.S. (Belfast): Lecturettes and Informal Discussion.
Feb 26th.—Society of Licensed Aircraft Engineers South Eastern Area Lecture. "Airframe Repairs," G. C. Banks, Manson House, 26, Portland Place, London, W.1, at 3 p.m.
Feb. 26th.—Helicopter Association of Gt. Britain: "Helicopter Transmission Systems," K. Watson, A.R.Ae.S.
Feb. 28th.—Institute of Public Administration: "The British Overseas Airways Corporation," J. O. Blair-Cunynghame.
Mar. 5th.—Rugby Football, Twickenham, Royal Navy *versus* The Army.
Mar. 8th.—R.Ae.S. (Belfast): "Helicopter Design," T. E. Goligher, B.Sc. D.I.C., A.F.R.Ae.S.
Mar. 9th.—R.Ae.S. (Weybridge): "Air Force Requirements and their Origin," Air-Cdre. G. W. Tuttle, C.B., C.B.E., D.F.C.
Mar. 9th.—R.Ae.S. (Preston): "Recent Developments in Aircraft Production Engineering," Professor J. V. Connolly, B.E., A.F.R.Ae.S.
Mar. 10th.—Timber Development Association: "Modern Adhesives—Their Present and Future Application," D. A. Hubbard.
Mar. 12th.—R.A.F. Bomber Command 1st Reunion, Albert Hall.
Mar. 12th.—British Interplanetary Society: "Review of Progress in Astronautics Since the War," A. V. Cleaver.
Mar. 15th.—Londonderry House: Films, "Hollandia Campaign in Dutch New Guinea, 1944," W. Courtenay, M.M.
Mar. 16th.—R.Ae.S. (Brough): "Aerodynamics." J. R. Ewans.
Mar. 18th.—Institute of Navigation: "The Use of Radar Beacons," K. A. B. Gilfillan, M.B.E.
Mar. 22nd.—R.Ae.S. (Belfast): Lecture by P. G. Masefield, M.A., F.R.Ae.S. G.I.Mech.E.
Mar. 26th.—Rugby Football, Twickenham. The Army *versus* Royal Air Force.
Mar. 26th.—Helicopter Association of Gt. Britain: Paper by Air-Cdre. W. H. Primrose, C.B.E., D.F.C.
Mar. 30th.—R.Ae.S. (Weybridge): Junior Prize Lecture.
Mar. 31st.—R.F.C. and R.N.A.S. Reunion, Londonderry House, W.1.
April 2nd.—British Interplanetary Society: "Astronautics and Astronomy," M. W. Ovenden, B.Sc., F.R.A.S.
April 13th.—R.Ae.S. (Brough): "Brabazon Aircraft," Mr. Pollicut.
April 15th.—Institute of Navigation: "The Influence of Echo Sounding," A. J. Hughes, O.B.E.
April 27th.—R.Ae.S. (Weybridge): "Present Day Problems in Safety Requirements," W. Tye, O.B.E., B.Sc., F.R.Ae.S.
May 18th.—R.Ae.S. (Weybridge): "Historical Review of Aircraft Development," Sir Frederick Handley Page, C.B.E., F.R.Ae.S.
May 26th and 27th.—National Physical Laboratory: "Open Days," May 26th for representatives of industrial organizations and May 27th for members of university staffs and government departments.
May 28th.—Wolverhampton Aero Club: "At Home" and air display.
July 2nd to 4th.—Royal Aero Club: Private air rally at Deauville. Guests of Mons. F. André.
July 4th to 11th.—Royal Aero Club: Private air rally to Spain.
July 16th and 17th.—Royal Aero Club: Private air rally at La Baule, St. Nazaire. Guests of Mme. André.

STILL IN THE NEWS: Recent events in the Middle East have served as a reminder that a number of R.A.F. units are still equipped with Spitfires. The specimen shown—a Merlin-engined Mark 16—is used by the Central Gunnery School for fixed-gun training.

SERVICE AVIATION

R.A.F. Appointments

ON January 17th A. Cdre. E. H. Richardson, C.B.E., takes up his new appointment as A.O.C. No. 27 (Training) Group, Technical Training Command. He has been Director of Signals at the Air Ministry for a year. A. Cdre. J. G. Hawtrey, C.B.E., becomes Air Officer in charge of Administration at Coastal Command with effect from January 19th, after two years at the Air Ministry as Director of Operations (Intelligence). On becoming Commandant of the R.A.F. Staff College, Andover, G/C. L. W. Cannon, C.B.E., who has been Assistant Commandant for the past year, receives the acting rank of Air Commodore. Before going to Andover A. Cdre. Cannon studied for a year at the Imperial Defence College.

Raid Reporting Exercises

THE first in a series of practice operations for men and women of the R.Aux.A.F.'s Fighter Control Units took place on Sunday, January 9th. The exercises are being held under operational conditions with the co-operation of aircraft from the Auxiliary flying squadrons, and one exercise will take place monthly in each of four main sectors—Northern, Eastern, Metropolitan, and Southern. On the first Sunday of each month the Northern sector will exercise, followed on successive Sundays by the Eastern, Metropolitan and Southern units.

During the exercises the regular Fighter Command control and reporting system operates, and it is intended that regular fighter squadrons will also take part as the scheme develops. Some members of F.C.U.s in remote districts may not at first be able to participate, but as daylight hours increase it is hoped to fly them into the sectors and thus include as many as possible in the exercises. During the winter months, hours of operation will be from 10 a.m. until 4 p.m.

Naval Appointment

IT is announced by the Admiralty that Rear Admiral D. H. Everett is appointed to the new position of Flag Officer, Ground Training, with effect from January 24th. Rear Admiral Everett will be responsible, as an additional sub-commander, to the Flag Officer Air (Home) for supervising the training of ground personnel employed in Naval Aviation, and will be the administrative authority for air stations and establishments concerned.

Royal Air Force and Naval Aviation News and Announcements

Recognition Contest

TWO Royal Air Force teams, one from H.Q., Coastal Command, and the other from R.A.F. Station, Kirton Lindsay, Lincs, have entered for this year's All-England Aircraft Recognition Contest, to be held by the Aircraft Recognition Society in the Royal Aeronautical Society's library at 4, Hamilton Place, London, W.1, next Wednesday evening, January 19th. There is a large entry from the A.T.C., including teams from No. 8F Coventry Squadron, Nos. 4F and 20F Ilford Squadrons, No. 11F Brooklands Squadron, No. 1454 Harrow Squadron, and No. 110 City of York Squadron, the last two of which have each entered two teams. Also participating will be members of the Royal Observer Corps from Stanmore, Stroud, Ashford (Kent), Bournemouth, Bedworth, and a number of London posts. Four independent modelling and recognition clubs and three teams from "Air Britain" will also compete for the trophy, a solid silver model of the Hurricane (illustrated in *Flight* of October 21st, 1948). The contest will consist of identifying 35 pictures of modern aircraft projected on a screen.

R.A.F. Graves in Poland

A MISSING Research and Enquiry team has now completed a search for the graves of British airmen shot down over Poland during the war. It has been probably the most successful search yet completed by the R.A.F. in any part of the world. Out of 75 missing aircraft, involving 426 aircrew, only three cases, involving nine crew members, remain unsolved. The bodies of the 417 officers and airmen located have been transferred to British military cemeteries. Two officers and a driver have spent eight months on the task and travelled some 25,000 miles across Eastern Europe. For working purposes the territory to be covered was divided into four areas—southern, western and northern Poland, and the Warsaw district, where the graves of the crews shot down on supply-dropping operations during the Warsaw risings of 1944 were discovered. A visit was also made to the cemetery at Sagan, where most of the urns containing the ashes of the 50 Stalag Luft III victims were found. These were later buried in the British Military Cemetery at Poznan. Polish authorities were found to be most helpful and co-operative throughout the search. The team consisted of S/L. E. Rideal, Maj. I. McEwan, of the Rhine

Army Graves Service, and A/C. E. Ashman, the driver.

Of the 41,881 British, Dominion and Allied aircrew missing during the war, just over 21,000 have now been accounted for. Of those still untraced, between 12,000 and 17,000 were probably lost in the sea, leaving between 4,000 and 9,000 still to be traced.

"Illustrious" Memorial Fund

NEARLY £4,000 was contributed to a memorial fund opened to assist the next-of-kin of the victims of the boat accident in Portland Harbour on October 17th, when a midshipman and 28 ratings were drowned.

The fund, which closed on December 31st, is known as the "H.M.S. *Illustrious* Memorial Fund, 1948."

Eskimo Trainers at Survival School

THE Royal Canadian Air Force is setting up a survival training school, to train its aircrews in methods of bush and Arctic survival, because of the rigorous climate and hazardous terrain encountered in normal flights over uninhabited areas. It has been shown that lack of knowledge of self preservation after forced landings in isolated districts has resulted in undue hardship and even death.

Instruction will be given in geography, first aid, use of emergency equipment and clothing, shelter and rescue technique. The school's staff will consist of experienced R.C.A.F. personnel, and a number of Eskimo and Indian instructors. Since the average Eskimo speaks little or no English, a course in basic Eskimo will be part of the syllabus.

R.A.F.'s 1948 Flying Statistics

DURING 1948 the R.A.F. logged approximately 900,000 flying hours, made up as follows: Flying Training Command (including Rhodesian Air Training Group), 263,000 hr; other Home Commands (including B.A.F.O. Germany), 416,000 hr; Overseas Commands, 94,800 hr; Reserve Command, 122,200 hr.

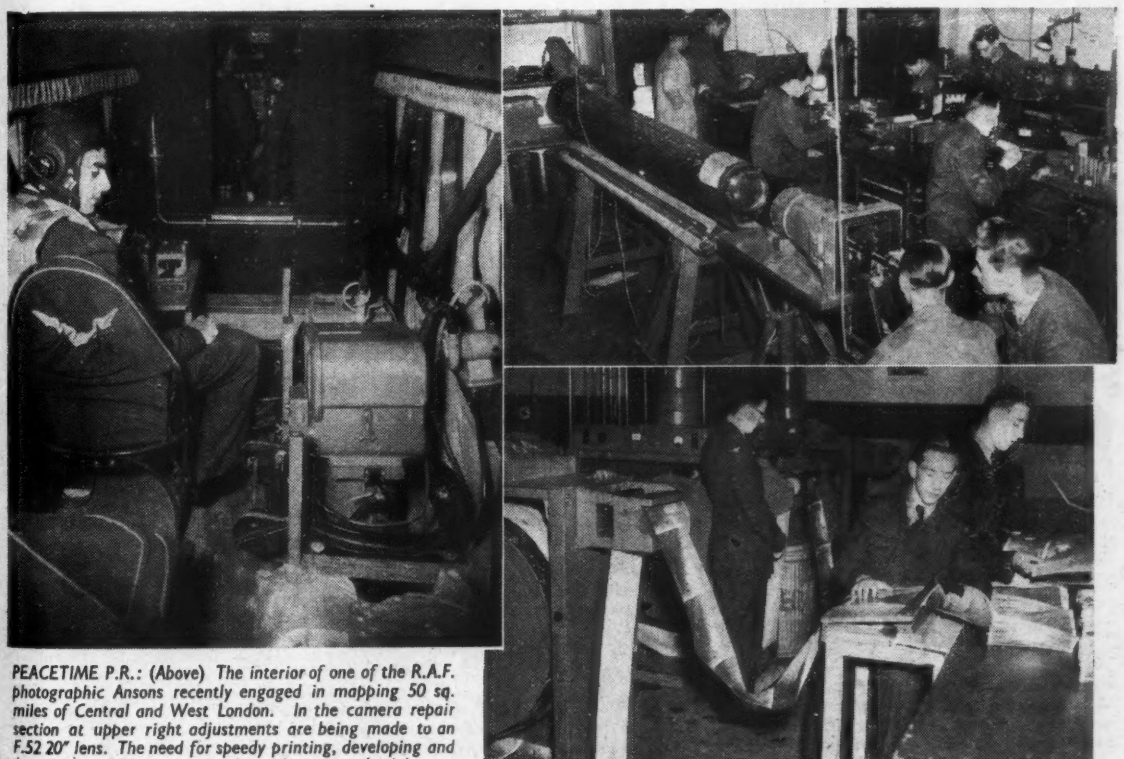
British mileage on the Berlin Air Lift had reached 13 million by the end of the year, and the tonnage carried 175,000.

R.A.F. in Scotland—1948

THOUGH now operating on a peacetime basis with only a fraction of the stations, aircraft and personnel of a few years ago, the R.A.F. in Scotland has had a busy and eventful year in 1948. Scotland's East Coast airfields staged one of the two big air-naval exercises of the year, and Stornoway saw the start and finish of the first double crossing of the Atlantic by jet aircraft—Vampires of Fighter Command. Throughout the summer R.A.F. Mosquitoes and Spitfires (on detachment from Benson) operated from Leuchars on an aerial photographic survey of Scotland, not only for revision of Ordnance Survey maps but also to produce new large scale series for planning purposes. Lancasters of No. 120 Squadron during the summer photographed more than 1,400 miles of the coastline of the Orkneys, Hebrides, Islay and Jura groups to "pinpoint" the location of seaweed beds for the Scottish Seaweed Research Association.

Coastal Command Ansons, operating from Kinloss, co-operated with fishery cruisers of the Scottish Home Department in "Operation Fish Patrol"—spotting "poaching" trawlers off the Scottish coast and photographing them from low level. For the second successive year, the King's Flight operated a helicopter mail service between Aberdeen and Balmoral while the Royal Family were in residence there in August. Scotland's Air/Sea Rescue organization, which operates from No. 18 Group H.Q., at Pitreavie Castle, Dunfermline, laid on a total of 24 searches—ten for aircraft missing over land, six for aircraft missing over the sea, six for vessels overdue or lost, one for a climber missing in the Ben Nevis range and one for a German prisoner who attempted to escape to sea in a dinghy near Berwick. Perhaps the most spectacular rescue was in July, when a Lancaster had to "ditch" near the Shetlands, and the crew of eight, after drifting ten hours in their rubber dinghy, were picked up by a flying boat. It was a R.A.F. Lincoln, working under Pitreavie's orders, which recently searched for and found seven survivors of the foundered S.S. *Rojo* in the North Sea. Mountain Rescue units from Kinloss and West Freugh were out on five occasions to aircraft crashes in the Scottish hills.

Scottish Reserve Forces of the R.A.F. continue to build up. New Fighter Control Units have opened up at Edinburgh and Glasgow, and others will start recruiting soon at Dundee, Aberdeen and Inverness. A second R.A.F.V.R. Centre opened at Bishopbriggs (Glasgow) during the year and a Flying School at Grangemouth. The A.T.C. with 3,200 cadets in 78 Scottish squadrons, is also steadily growing. A new squadron in Edinburgh has enrolled



PEACETIME P.R.: (Above) The interior of one of the R.A.F. photographic Ansons recently engaged in mapping 50 sq. miles of Central and West London. In the camera repair section at upper right adjustments are being made to an F.52 20" lens. The need for speedy printing, developing and drying of film is met by the multi-printer (right).

Service Aviation . . . . .

125 cadets inside four weeks. Progress has been made with the decentralization of the A.T.C., and Wings are now in existence at Edinburgh and Glasgow, with others planned for Inverness, Aberdeen, Dundee and Dumfries.

The Greenock-based Ocean Weather Ship Service of the Air Ministry's Meteorological Office came into full operation with four ships—converted corvettes—two of which are simultaneously on station in the North Atlantic. One of these ships, the *Weather Recorder*, was in the news in January, when it rescued 28 men from the Norwegian steamer *Veni*, wrecked off Islay.

Medal Distribution

WAR medals and campaign stars have now been despatched to nearly 300,000 serving and wartime members of the Royal Air Force, it is officially announced. Approximately 50,000 R.A.F. claimants have not yet received their stars and medals. In most cases this is because no provisional medal assessment forms are held for them. All claims are dealt with as quickly as possible, but where no assessment is available there may be a delay of several months. In such cases service records must be searched and entitlements checked, and this entails much work. For example, the instructions governing medal awards cover 28 closely printed pages, and include about 150 different geographical areas with qualifying dates. Claims for the clasp to the Africa Star must be checked against a list of over 450 units and dates before being approved. Where provisional assessment forms are held by the Air Ministry applicants normally receive their medals and stars in about a fortnight.

RESERVISTS RELAX: Shown above are three of the 300 guests at the R.A.F. Reserves Club Ball on Dec. 21st—(L. to R.) Mr. Stewart MacPherson who auctioned some original drawings by David Langdon, a club member (centre); and Miss Julie Harris.

FOR B.A.F.O.: The R.A.F.'s Inspector-General, Air Marshal Sir Leslie N. Hollinghurst, appeared to be in a jovial mood as he left Northolt recently to visit R.A.F. units in Germany. He is accompanied by the Station Commander, G/C. Hodgson.

R.A.F. Permanent Commissions

GENERAL DUTIES BRANCH.

Wing Commander: P. R. Woodward, D.F.C.

Squadron Leaders: I. M. R. Brownlie, D.F.C., P. J. Camp, D.F.M., T. F. C. Churcher, D. C. Colebrook, K. V. Gilling, A.F.C., E. J. Harrod, D.F.C.

Flight Lieutenants: A. D. Alexander, D.F.C., N. W. Andrews, R. N. Archer, H. A. Askers, D.F.C., D.F.M., G. P. B. Bailey, L. A. Baldchin, E. R. Bangor-Jones, J. L. Barlow, S. J. Barton, F. P. Brown, R. H. Burr, D.F.M., C. K. Cooke, C. W. Cornish, L. V. Dale, F. G. DePass, F. Ellison, A.F.C., D. Francis, D.F.C., G. E. H. Hackman, D. J. Harper, A. Harris, S. Hatton, R. F. Hilton, E. A. Johnson, D.F.C., A.F.C., C. King, D.F.M., A. Knapper, M.V.O., A.F.C., J. Lawson, D.F.M., G. H. J. Leonard, D.F.C., P. D. Lowe, T. P. McGarry, D.F.C., R. W. Manthorpe, P. G. Marman, R. F. H. Martin, T. W. Monaghan, I. G. G. Potts, W. J. H. Roberts, E. Robinson, W. G. Shearer, G. N. Sims, D.F.C., V. A. Stevens, R. C. Stewart, D. H. Tew, H. M. H. Tudor, D.F.C., P. J. Wells, J. E. Whitlock, D.F.C.

Flying Officers: J. J. Connors, A. A. Evans, D. A. Lewis, A. T. Newman, K. E. V. Price, I. E. Smith, F. M. N. Taplin, R. A. Turnbull, J. N. B. Unwin.

TECHNICAL BRANCH.

Squadron Leaders: C. E. J. Hackett, J. A. Sherry.

Flight Lieutenants: R. H. Brooks, C. A. Brown, E. P. Cooban, W. W. Fuller, R. C. Gates, P. Green, A. G. Harris, A. H. D. Johnson, B. Lax, G. E. Lazzary, W. Martin, D. S. Perrin, D. Phillips, D.F.C., W. H. Phipps, D. Pocknell, G. N. Rushen, K. Smith, W. A. Tait, F. G. Thouard, J. C. Woolard.

Flying Officers: D. O. Parry-Davies, T. G. Roycroft.

EQUIPMENT BRANCH.

Squadron Leaders: E. G. Briggs, P. G. Farley, D. C. Walker.

Flying Officers: J. F. Barford, J. E. D. Buckley, L. Hanford, E. L. C. Higgs, D. J. Macleod, P. F. Pacey, A. H. E. Purnell, R. W. Sparkes, D.F.C.

Pilot Officer: W. P. Fogden.

SECRETARIAL BRANCH.

Wing Commander: J. H. Sindall, D.S.O

Squadron Leader: K. J. F. Toop.

Flight Lieutenants: E. E. Allen, A.F.C., J. L. Bayley, F. Hawley, G. T. McGrath, N. S. H. Smith, J. Wilson.

Flying Officers: P. C. Austin, A. Barrington, F. N. Barrington, J. E. Bliss, A. T. Boarder, F. G. Hill, D. J. W. J. Logan, F. Ridgeway, M.B.E.

AIRCRAFT CONTROL BRANCH.

Squadron Leader: D. L. Grout, A.F.C.

Flight Lieutenants: A. W. Allison, D.F.C., L. W. N. Booth, D.F.C., R. Carnall, A. E. Forgeard, A. J. T. Hill, B.E.M., J. A. Jarvis, D.F.C., A.F.C., C. E. Jones, D.S.M., G. W. Kirby, M.B.E., F. J. F. Lucie, R. D. S. Orchard, J. E. Ryan, E. A. Shipman, A.F.C., E. G. Smith, J. Watson, A.F.C., J. R. Watt, A.F.C.

Flying Officers: J. B. Boulton, H. G. Brookes, K. G. H. James, G. J. Julian, H. J. Lawson, R. E. Michie, A. A. Taylor.

MEDICAL BRANCH.

Squadron Leaders: J. I. M. Smith, M.R.C.S., L.R.C.P., T. H. Redfern, M.B., Ch.B., L.R.C.P., M.R.C.S.

Flight Lieutenants: G. R. Bedford, M.B., Ch.B., R. C. Jennings, L.M.S.S.A., M.B., B.S., E. W. F. Mack, M.R.C.S., L.R.C.P.

CHAPLAINS' BRANCH.

The Reverends: C. Bevan (United Bd.), J. T. Carberry (R.C.), L. Deegan (R.C.), D. T. Jones, B.A. (Presbyterian), W. H. Stanger (C. of E.).

PHYSICAL FITNESS BRANCH.

Flying Officers: J. L. Petrie, H. L. Plimmer, D.F.C., R. J. Steele.

Reunions

A REUNION is proposed for past and present staff officers of No. 41 Group Headquarters. All interested are asked to write to P.A. to A.O.C., H.Q., 41 Group, R.A.F., Andover, stating whether their preference is for a reunion at London or Andover.

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The fourth annual Reunion of No. 83 Group Officers' Association will be held in London on Friday, April 1st, 1949. Tickets 12s 6d. each (exclusive) may be obtained from F. B. Berry, 11, Bush Hill Road, London, N.21.

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A Reunion Dinner for No. 210 Squadron, R.A.F., will be held at the Windsor Castle Hotel, Wilton Road, London, S.W.1, on Friday, January 28th. Past or present members wishing to attend should communicate with the Honorary Secretary, S/L. L. G. M. Rees, R.A.F. (ret.), at 59, Westerham Avenue, Edmonton, London, N.9.